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40 CFR Parts 260, 264, 265, 270, and 271
Liners and Leak Detection Systems for Hazardous Waste Land Disposal Units; Final Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 260, 264, 265, 270, and 271

[FRL-4028-2]

RIN 2050-AA76

Liners and Leak Detection Systems for Hazardous Waste Land Disposal Units

AGENCY: Environmental Protection Agency.

ACTION: Notice of final rulemaking.

SUMMARY: The Environmental Protection Agency (EPA) is today amending its current regulations under the Resource Conservation and Recovery Act (RCRA) concerning liner and leachate collection and removal systems for hazardous waste surface impoundments, landfills, and waste piles. EPA is also adding new regulations requiring owners and operators of hazardous waste surface impoundments, waste piles, and landfills to install and operate leak detection systems at such time as these units are added, laterally expanded, or replaced. EPA is promulgating most of these regulations in response to the requirements of the 1984 Hazardous and Solid Waste Amendments (HSWA) to RCRA.

EFFECTIVE DATE: July 29, 1992.

ADDRESSES: The public docket (docket reference code F-92-LLDF-FFFFF) for this rule is in room M2427, US EPA, 401 M Street SW., Washington, DC 20460, and is open from 9 am to 4 pm, Monday through Friday, excluding holidays. Call 202-260-9327 for an appointment to review docket materials. Up to 100 pages may be copied free of charge from any one regulatory docket. Additional copies are $0.15 per page.

FOR FURTHER INFORMATION CONTACT: The RCRA/Superfund Hotline at 1-800-424-9346 (toll free), or 703-920-9810 in the Washington, DC area. For information on technical aspects of this rule, contact Ken Shuster, Office of Solid Waste (OS-340), U.S. Environmental Protection Agency, 401 M St SW., Washington, DC 20460, 202-260-2214.

SUPPLEMENTARY INFORMATION: Copies of the following documents are available for purchase through the National Technical Information Services (NTIS), U.S. Department of Commerce, Springfield, VA 22161, phone 1-800-553-6847 or 703-487-4650: (1) U.S. EPA, "Compilation of Current Practices at Land Disposal Facilities", January 1992; (2) U.S. EPA, "Action Leakage Rates for Leak Detection Systems", January 1992.

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I. Authority

These regulations are being promulgated under authority of sections 3004, 3005, 3006, and 3015 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act, as amended, 42 U.S.C. 6924, 6925, 6926, and 6936.

II. Background

On November 8, 1984, Congress enacted the Hazardous and Solid Waste Amendments (HSWA) to the Resource Conservation and Recovery Act (RCRA), placing stringent new requirements on the land disposal of hazardous waste. Among other requirements, Congress amended section 3004 of RCRA and added section 3015 to impose specific design standards for land disposal units.

Section 3004(o)(1)(A) of RCRA, added by HSWA, requires each new landfill and surface impoundment, and each replacement and lateral expansion of a landfill and surface impoundment for which an application for a final permit determination is received after November 8, 1984, to install two or more liners (i.e., a double-liner system) and a leachate collection system above (for landfills) and between the liners. Section 3004(o)(5)(A) of RCRA requires EPA to promulgate regulations or issue technical guidance implementing the requirements of section 3004(o)(1)(A) by November 8, 1986. These HSWA requirements for double liner systems are intended to prevent the migration of hazardous constituents to ground water from land disposal units. Until the effective date of regulations promulgated under section 3004(o)(5)(A), Congress provided that an interim statutory double-liner standard in section 3004(o)(5)(B) could be used to meet the section 3004(o)(1)(A) double-liner system requirement.

Section 3004(o)(4) of RCRA requires EPA by May 8, 1987, to promulgate standards requiring new landfills, surface impoundments, waste piles, land treatment units, and underground hazardous waste tanks to use approved leak detection systems. The statute defines an "approved leak detection system" as a system or technology that EPA determines to be "capable of detecting leaks of hazardous constituents at the earliest practicable time." The term "new units" is defined as those units on which construction commences after the date of promulgation of the Agency's rule for leak detection systems. The impact of this language upon the applicability of this rule between today's promulgation and the effective date July 29, 1992 is discussed elsewhere in this preamble (See Section IV.A.).

Section 3015(a) of RCRA establishes standards for interim status waste piles. Any new waste pile, or replacement or lateral expansion of an existing waste pile at an interim status facility, must comply with requirements for liners and leachate collection systems or equivalent protection provided in regulations issued by EPA under section 3004 of RCRA before October 1, 1982, or revised under section 3004(o) of RCRA with respect to waste received beginning May 8, 1985.

Section 3015(b) of RCRA establishes standards for interim status surface impoundments and landfills. Any new unit, or replacement or lateral expansion of an existing unit at an interim status facility, is subject to the requirements promulgated under section 3004(o)(1) (relating to double-liners and leachate collection systems), with respect to waste received beginning on May 8, 1985.

The HSWA requirements described above either directly amended or directed the Agency to amend the existing RCRA liner standards for new hazardous waste landfills, surface impoundments, and waste piles issued by EPA on July 26, 1982 (47 FR 32262). On July 15, 1985, EPA issued a final rule (50 FR 28702) amending the existing liner standards by codifying the new liner standards of sections 3004(o)(1)(A), 3004(o)(5)(B), and 3015 (a) and (b) that

were to become effective immediately or shortly after the enactment of HSWA, as directed by the statute.

On March 28, 1986 (51 FR 10706), under section 3004(o)(5)(A) of RCRA, EPA proposed amendments to the statutory double-liner and leachate collection system standards for surface impoundments and landfills codified in EPA's regulations on July 15, 1985. The proposal set forth two types of designs for double-liner systems. One design consisted of a geomembrane (then referred to as a flexible membrane liner (FML)) as the top liner and a composite bottom liner consisting of a geomembrane underlain by compacted soil material to minimize flow through the geomembrane component should a breach occur, and having a hydraulic conductivity of no more than 1×10^{-7} cm/sec. The other proposed double-liner design consisted of a geomembrane top liner and a bottom liner constructed to prevent migration through the liner through the post-closure period and of at least 3 feet of compacted clay or other compacted soil material with a hydraulic conductivity of no more than 1×10^{-7} cm/sec. On April 17, 1987, EPA published a notice (52 FR 12566) requesting additional comments on certain aspects of the March 28, 1986 proposal. Specifically, EPA requested comments on data that demonstrated the advantages of a composite bottom liner versus a compacted soil material bottom liner. EPA also noticed the availability of two draft technical guidance documents for the design, construction, and operation of single- and double-liner systems and leachate collection systems. EPA solicited comments from the general public on the draft technical guidance documents.

On July 14, 1986 (51 FR 25422), EPA promulgated leak detection system requirements for underground hazardous waste tanks. In promulgating these regulations, EPA partially fulfilled its mandate under section 3004(o)(4) of RCRA to establish leak detection system requirements.

On May 29, 1987 (52 FR 20218), EPA proposed a rule establishing leak detection system requirements to fully implement section 3004(o)(4) of RCRA. The proposal specified design standards for leak detection systems for new and replacement landfills, surface impoundments, land treatment units, and waste piles, and for lateral expansions of these units at both permitted and interim status facilities. The proposal also expanded the double-liner requirements to waste piles. The proposal also included a requirement for a construction quality assurance program to be implemented by owners and operators to ensure the proper construction, installation, and closure of these units. Finally, the proposal included a requirement to develop a response action plan specifying actions that would be taken in reaction to liquid flow into the leak detection system above action leakage rates proposed by the owner or operator and approved by the Regional Administrator.

Today's rule finalizes EPA's proposed actions of March 28, 1986 and May 29, 1987, and completes the Agency's statutory rulemaking responsibilities imposed by RCRA sections 3004(o)(4) and 3004(o)(5)(A). EPA has not included additional leak detection standards for permitted land treatment units in today's rule because, as explained later in today's notice, existing unsaturated zone monitoring requirements in §§ 264.278 and 265.278 for such units are sufficient to ensure the detection of leaks at the earliest practicable time.

III. Summary of Today's Rule

A. Summary of Rule

Today's rule modifies the existing double-liner and leachate collection and removal system requirements for new and replacement surface impoundments and landfills and for lateral expansions of these units, including those units at interim status facilities. New surface impoundment and landfill units for which construction commences after January 29, 1992, and replacement units reused after and lateral expansions of existing units for which construction commences after July 29, 1992 must have a double liner consisting of a top liner designed to prevent the migration of hazardous constituents into the liner during the active life and post-closure period (e.g., a geomembrane) and a composite bottom liner consisting of a geomembrane underlain by at least 3 feet of compacted soil material having a hydraulic conductivity of no more than 1×10^{-7} cm/sec. EPA is also extending the revised landfill double-liner and leachate collection and removal system requirements to new waste pile units for which construction commences after January 29, 1992, and replacement units reused after and lateral expansions of waste pile units for which construction commences after July 29, 1992.

Today's rule also requires a leak detection system for each new surface impoundment, waste pile, and landfill for which construction commences after January 29, 1992, and each replacement surface impoundment, waste pile, and landfill reused after, and each lateral expansion of these units for which construction commences after July 29, 1992. The leachate collection and removal system drainage layer immediately above the bottom composite liner at these units must be used as the leak detection system. The drainage layer functioning as the leak detection system must meet minimum design criteria and ensure that leaks are detected at the earliest practicable time. Specifically, the drainage layer bottom slope must be one percent or more. If granular material is used in the drainage layer, it must have a minimum hydraulic conductivity of 1×10^{-2} cm/sec for waste piles and landfills and 1×10^{-1} cm/sec for surface impoundments and a minimum thickness of 1 foot. If synthetic drainage material is used in the drainage layer, the drainage material must have a minimum hydraulic transmissivity of 3×10^{-5} m²/sec for waste piles and landfills and 3×10^{-4} m²/sec for surface impoundments. These transmissivities are equivalent to the above hydraulic conductivities and thickness specifications for granular drainage layers. EPA is requiring that each unit have a leak detection sump to collect and remove liquids, sized to prevent liquids from backing up into the drainage layer. In lieu of meeting these requirements, the owner or operator may receive a variance for an alternative leak detection system that functions in an equivalent manner.

EPA is establishing a site-specific action leakage rate that specifies a liquid flow rate detected in the leak detection system sump that warrants followup actions by the owner or operator. Owners and operators are required to develop a response action plan specifying monitoring, inspection, and corrective measures to be implemented if the action leakage rate is exceeded.

The Agency is requiring owners and operators of units affected by today's rule to develop a construction quality assurance (CQA) program for various components of surface impoundments, waste piles, and landfills. The program will be implemented through a construction quality assurance plan that the owner or operator prepares to ensure that the constructed unit meets or exceeds all design criteria, plans, and specifications.

Owners or operators of facilities applying for a permit for new surface impoundments, waste piles, and landfills must submit information on liners and leak detection system designs, the action leakage rate, the response action plan, and CQA plans as part of the permit application. For new and replacement surface impoundment, waste pile, and landfill units, and lateral

expansions of existing units at permitted facilities, owners and operators must submit this information as part of a permit modification request. For affected units at interim status facilities, the owner or operator must submit proposed action leakage rates, response action plans, and a certification that construction has been completed according to the design specifications in the CQA plan to the Agency in advance of the receipt of wastes. Liner and leak detection system designs and CQA plans need not be submitted to EPA, but must be maintained on site.

B. Achievement of EPA Program Goals

In developing today's rule, EPA paid careful attention to several principles that now guide its environmental programs: Pollution prevention, ground-water protection, cost-effective policies which provide protection of human health and the environment, flexibility in implementation, and fostering of an effective State-Federal partnership. Today's rule incorporates each of these principles.

The primary focus of today's rule is on pollution prevention and, more specifically, on ground-water protection. Effective liner and leak detection systems will minimize the potential for releases of hazardous constituents from hazardous waste land disposal units to underlying ground water. In this way, today's rule complements the Agency's waste minimization policies, which seek to reduce the quantities of waste produced, and the RCRA land disposal restrictions programs. Today's liner and leak detection standards contribute to pollution prevention by providing for the containment and isolation of hazardous waste after final disposal.

In today's rule, EPA has taken an important step in implementing its Ground-Water Principles, recently published in the Agency's "Protecting the Nation's Ground Water: EPA's Strategy for the 1990's (21Z–1020, July 1991). A central theme in EPA's ground-water policy, enunciated in the principles, is that prevention of ground-water contamination is often more cost effective and environmentally more desirable than remediation of ground-water after contamination. Experience in the RCRA and Superfund programs demonstrates that improperly designed landfills, surface impoundments, and waste piles can result in ground-water contamination. At the same time, remediation of contaminated ground-water has proved to be time-consuming, expensive, and in some cases technically infeasible. On the other hand, the release of hazardous constituents from landfills, surface impoundments, and waste piles can largely be eliminated through good design and construction.

Regarding costs, it should be noted that most of the standards incorporated into today's rule are already widely in use at hazardous waste facilities and are generally considered good engineering practices. Because HSWA required new landfills and surface impoundments, and lateral expansions and replacements of existing landfills and surface impoundments, for which an application for a permit is received after November 8, 1984, and those units in interim status receiving waste after May 8, 1985, to be designed with double-liner and leachate collection systems, most facilities already meet many of the design standards of today's rule. In addition, many facilities have designed units that are in compliance with today's final rule in anticipation of the promulgation of a final rule based on the March 28, 1986, and May 29, 1987 proposed rules. Thus, for a relatively small increase in cost (to those facilities that are not already meeting the standards of today's rule), the rule may save large corrective action costs. However, since all new units must comply with all the provisions of this rule and bear the corresponding costs, EPA has carefully chosen the minimum technical standards that adequately protect human health and the environment.

Although today's rule includes specific design standards, EPA has taken care to ensure that its requirements can be flexibly implemented. The presence of specific standards in the rules will simplify compliance by the regulated community, implementation by EPA and State permit writers, and enforcement by EPA and state officials. EPA, however, recognizes that national design standards may not be appropriate for every site and that technologies may improve. Therefore, today's rule allows EPA or an authorized State to approve alternative designs, as long as they achieve comparable or better levels of performance.

Similarly, today's rule requires construction quality assurance—a critical feature in land disposal unit construction—but it does so through general narrative performance standards. Thus, facility owners or operators can tailor the details of their construction quality assurance plans to the specifics of their facilities. These and similar provisions of today's rule ensure that the rule can be flexibly implemented, in a way that accommodates each regulated unit.

Finally, in today's rule EPA has paid special attention to eliminating the frequent strains resulting from the joint implementation of RCRA by EPA and the States. In proposals for this rule, EPA laid out a complicated State authorization process, which would require EPA to implement some parts of the rule for selected land disposal units and the States to implement other parts for the same units, over different timeframes. After radically simplifying the proposal, EPA is now promulgating most of the rule under HSWA, which avoids much of the confusion of joint implementation at individual units. In this way, today's rule is consistent with the Agency's attempt to simplify and rationalize Federal and State implementation of RCRA. Today's rule also requires fewer reports and mandatory Agency reviews than the proposal while still providing opportunity for Agency reviews.

IV. Detailed Discussion of the Final Rule

A. Scope of the Rule

The double liner and leak detection standards in today's final rule apply to new and replacement landfills, surface impoundments, and waste piles, and lateral expansions of these units. Today's rule applies, as it was proposed in May, 1987, to these units regardless of their permit status, including facilities that were issued permits prior to and after the enactment of HSWA and facilities that are still in interim status. In consideration of the explicit language of section 3004(o)(4) defining a new unit as a unit for which construction commences after the promulgation date of today's rule, the Agency maintains that the permit does not act as a shield with respect to the leak detection requirements under today's rule for new units. Because lateral expansions and replacement units are comparable in their environmental impact, the Agency has, as a policy matter, decided to similarly remove the permit as a shield for leak detection systems at replacement units and lateral expansions of existing units. EPA believes that the opportunity for constructing replacement units and lateral expansions of existing units to meet today's requirements is similar to that for new units. In addition, by requiring replacement units and lateral expansions at existing units to meet today's requirements, EPA is ensuring that these units meet the same minimum technological requirements and provide the same protection of human health and the environment. Therefore, the Agency is amending § 270.4 to require

owners or operators to apply for a permit modification to meet the standards of today's final rule. Owners and operators at permitted facilities may not begin construction of units subject to today's requirements, until the permitting Agency has approved the owner or operator's permit modification (see § 270.42).

Today's rule exempts certain replacements of permitted surface impoundment, waste pile, and landfill units from today's double-liner and leak detection system requirements. However, EPA has modified the scope of the exemption since the May 29, 1987 proposal. Sections 264.221(f), 264.251(f), 264.301(f), 265.221(c), 265.254(a), and 265.301(c) in today's rule exempt replacements of surface impoundments, waste piles, and landfills from the double-liner system and leak detection requirements if the replacements meet the following conditions: (1) The existing unit was constructed in compliance with the design standards for double-liner and leachate collection systems in sections 3004 (o)(1)(A)(i) and (o)(5) of RCRA; and (2) there is no reason to believe that the liner system is not functioning as designed. Of course, any replacement surface impoundment, waste pile, or landfill unit that otherwise qualified for a variance from the double-liner and leachate collection system requirements pursuant to sections 3004(o)(2), 3004(o)(3), or 3005(j) of RCRA remains exempt from today's double-liner and leak detection requirements.

In the May 29, 1987 proposed rule, EPA considered exempting replacements that were constructed in compliance with existing part 264 single-liner requirements for surface impoundments, waste piles, and landfills. EPA acknowledges that the arguments for this exemption in the proposed rule were erroneous and has decided not to exempt replacements of permitted single-lined surface impoundments, waste piles, and landfills in today's final rule, because owners or operators of these units have no early method of detecting whether the single liner is leaking. Owners or operators of such units would have to rely on ground-water monitoring to determine if the single liner was leaking. EPA agrees with the commenters that this is inconsistent with the statutory goal of leak detection at the earliest practicable time and of preventing leakage out of the unit.

The May 29, 1987 proposal indicated an effective date for most of the provisions, including the leak detection requirements, of six months after promulgation. The July 29, 1992 effective date of today's rule is consistent with that proposal and with section 3010(b) of RCRA. It is important to note that section 3004(o)(4)(B)(ii) defines "new units" as those units on which construction commences after date of promulgation (versus the effective date) of the Agency's rule for leak detection systems. Therefore, due to the clear language of the statute, construction of new landfills, new surface impoundments, and new waste piles is defined with respect to the promulgation date but today's final regulations become effective 6 months after promulgation. This interpretation is consistent with the Agency's definition of "new tank systems" discussed in the final hazardous waste tank requirements (51 FR 25446).

During the six month time period between promulgation and the effective date, owners and operators of new units have time to determine and then make any necessary adjustments to their designs, contract specifications, and other pre-construction plans so that the requirements of today's rule are satisfied by the effective date. This also allows adequate time, in the Agency's opinion, for preparation and submission to the Agency of documents and requests for approvals that are prerequisites to construction and operation. For permitted facilities, this includes permit modification requests. Similarly, any interim status facility that adds a new unit following the promulgation date is expected to comply with the requirements in today's rule to submit, along with their notification under §§ 265.221(b), 265.254(a), or 265.301(b), proposed action leakage rates and a response action plan, if the due date for that notification (i.e., at least 60 days prior to receipt of waste in the new unit) falls before the effective date.

Thus, the Agency anticipates that at the few facilities (both permitted and interim status) that plan to develop new units during this six month period, most of the effort will be the preparatory design and administrative work needed to comply by the effective date. If owners or operators at interim status facilities should commence construction of new units during this period, the construction would be subject to Agency review upon the effective date of today's requirements.

Replacement landfills, surface impoundment, or waste piles, or lateral expansions to those units are, in the absence of specific statutory direction, subject to this rule after July 29, 1992 (i.e., six months after promulgation as normally provided under section 3010(b) of RCRA).

It should be noted that EPA interprets the term "construction commences," as used in the "new unit" definition of section 3004(o)(4)(B)(ii) and in today's rule, according to its definition within the § 260.10 definitions of "existing hazardous waste management (HWM) facility" and "existing tank system." That is, a unit has commenced construction if (1) the owner or operator has obtained the Federal, State and local approvals or permits necessary to begin physical construction, and either (2)(i) a continuous on-site, physical construction program has begun; or (ii) the owner or operator has entered into a contractual obligation—which cannot be canceled or modified without substantial loss—for physical construction of the facility to be completed within a reasonable time. Therefore, any new unit that has commenced construction, according to this long-standing Agency definition of the term, prior to the promulgation date (i.e., today's **Federal Register** publication date) is outside the scope of today's rule. Similarly, any replacement unit that is reused (unlike new units and lateral expansions, construction is not a necessary step prior to reuse of a replacement unit) or lateral expansion on which construction commences prior to the effective date (i.e., six months after today's **Federal Register** publication date) of this rule is also beyond the scope of today's rule.

Today's rule includes a definition of "replacement unit" in § 260.10. EPA is today defining a replacement unit as a unit (1) from which all or substantially all of the waste is removed, and (2) that is subsequently reused after July 29, 1992 to treat, store, or dispose of hazardous waste. This definition, which is similar to the May 29, 1987, proposal, is consistent with the definition EPA has used in implementing the statutory liner requirements of section 3004(o)(5)(B) for replacement units.

In the 1987 proposal, EPA excluded from the definition of replacement units those units from which waste was removed and treated in preparation for closure and only the treated waste was replaced in the unit. EPA explained in the proposal that replacement units are units that remain in service for active waste management, not units that are permanently taken out of service through closure. EPA believed this approach not only reflected statutory intent, but also would encourage (or at least not discourage) environmentally beneficial activities during closure (e.g., waste treatment), because owners or

operators would not have to retrofit closing units from which waste was removed and replaced.

Today's definition of "replacement unit," like the proposal, exempts certain units undergoing closure. However, the exemption is slightly expanded in that today's definition of replacement unit would also exempt those closing units that receive compatible wastes from other closing units and/or corrective action areas at the facility, provided that such use of the closing unit is approved by EPA (or an authorized state) in the facility's closure plan or corrective action program. The Agency believes that the expanded exemption is a logical extension of the proposal since it is similarly necessary to encourage environmentally beneficial activities (e.g., treatment and consolidation of compatible wastes from on-site closing units into one unit, waste removal to inspect a liner, expeditious closure of other on-site units) that may not otherwise occur if the owner or operator had to retrofit the closing unit to meet today's liner and leak detection system requirements.

Thus, units and activities qualifying for exemption from the "replacement unit" definition are limited to the following conditions and safeguards: (1) The activity must be reviewed and approved by EPA or an authorized state as part of the closure plan or corrective action approval process, including a corrective action order; (2) only closing units that have notified EPA in accordance with § 264.113 or § 265.112 or notified an authorized State, may qualify; and (3) only compatible waste and debris that are from closing units or corrective action areas on-site may be deposited in these units. For a unit to qualify for this exemption, off-site waste, new waste generated on site, and waste from active units on site may not be disposed of in the unit.

The situations EPA envisions as qualifying for this exemption from the "replacement unit" definition include: (1) Waste is removed from a closing unit, treated (e.g., incinerated, dewatered, or solidified), and returned to the same unit; (2) waste is removed from a closing unit to inspect and/or repair the liner, and the waste is returned to the same unit; (3) scenario 1 or 2, plus waste from other closing units is disposed in the original unit; and (4) scenario 1 or 2, plus waste that is the result of corrective action at the same facility, is placed into the original unit.

Finally, EPA also proposed in the May 29, 1987, rule that the liner and leak detection system requirements apply to significant unused portions of existing units, where those portions did not have double liners and leachate collection systems meeting the minimum technological requirements. Today's rule has dropped this requirement. A number of commenters on the proposal pointed out the difficulty of defining "significant" unused portions of a unit, and EPA was unable to develop an unambiguous definition. Furthermore, after reviewing land disposal units constructed and permitted since 1984 (which is the universe most likely to have portions of units not yet covered by wastes), EPA noted that virtually all of these units were required in their permits to incorporate double liner and leak detection requirements into their respective designs. Therefore, EPA has concluded that it is no longer necessary to extend today's rule to significant unused portions of existing units. It should be noted, however, that lateral expansions of existing units remain subject to today's rule.

B. Standards for Liners and Leak Detection Systems

1. Technical Standards for Liner Systems

Today, EPA is promulgating regulations containing design standards for double liners in accordance with the requirements of section 3004(o)(1) and (o)(5)(A) of RCRA. These standards replace those contained in the interim statutory design provision of section 3004(o)(5)(B) of RCRA that were codified on July 15, 1985 (50 FR 28702).

Today's rule amends the double-liner requirements for surface impoundments and landfills in §§ 264.221(c), 264.301(c), 265.221(a), and 265.301(a). The major change from the existing rule is that the final rule requires owners or operators to install a composite bottom liner. Based on available data and public comments received by the Agency, the double liner system specified in today's rule, with the composite bottom liner, represents the best available technology with respect to: (1) Preventing hazardous constituent migration out of the unit during the active life and post-closure care period, (2) detecting leaks through the top liner at the earliest practicable time, and (3) maximizing the efficiency of the leachate collection and removal system.

Today's rule does not change the existing top liner performance standard for surface impoundment and landfill units. Owners or operators of affected units must still design the top liner to prevent the migration of hazardous constituents into the liner throughout the active life and post-closure period. EPA notes that for purposes of today's rule, the top liner is the liner directly above the leachate collection and removal system serving as the leak detection system (see Technical Standard for Leak Detection Systems in Section IV.B.2 of today's preamble).

The Agency, in the preambles to the July 26, 1982 rule (47 FR 32274) and the March 28, 1986 proposal (51 FR 10709), endorsed geomembranes as meeting the top liner performance standard. EPA was aware of a number of landfill unit designs that included a composite top liner consisting of a geomembrane upper component and a compacted soil or a soil/bentonite blanket lower component. Consequently, EPA raised several questions in the preamble to the May 29, 1987 proposal concerning the use of a composite liner as a top liner and the effect the compacted soil component would have on other components of the double liner system, principally the early detection of a leak through the upper geomembrane.

The Agency received several comments on this issue, all of which were in favor of allowing the use of a composite liner as a top liner. One comment on appropriate standards for a composite liner favored minimum thickness requirements for a compacted soil lower component. Most commenters, however, favored no restrictions on the use of top composite liners.

In response to these comments, EPA is not prohibiting the use of composite top liners in today's rule. A parenthetical reference to geomembranes has been included as an example to illustrate that the performance standard can be met through use of a geomembrane. EPA does not intend that this reference be interpreted to mean that the geomembrane is the only top liner design that will meet the performance standard. EPA does not want to discourage owners or operators from using top composite liners because such liners can provide additional environmental benefits by minimizing the flow rate through a leak in a geomembrane liner and potentially minimizing migration of hazardous constituents by attenuation. Although not specified in today's rule, EPA maintains that the soil component of the top liner, however, should generally not be more than three feet thick since a thickness of 2 to 3 feet adequately serves the purpose of minimizing the flow through the geomembrane component (a lesser thickness may be appropriate for soil/bentonite blankets). EPA finds that this depth balances the increased environmental protection afforded by top composite liners and the ability to detect leaks at the earliest

practicable time. The Agency does not intend, however, to imply that multiple liner systems (including multiple composite liners) or that thicker soil components of bottom liners (e.g., 4 or 5 feet) should be precluded.

EPA notes that such general performance standards provide flexibility which is essential since liner and leak detection system technologies have advanced significantly over the past several years and are continuing to do so. Some examples include the use of geonets, the use of geotextile fabric filters, and better seaming and construction quality assurance. Recent EPA studies show soil/bentonite blankets may be effective and reliable complements to top liners, resulting in a new type of composite top liner. As technologies improve, today's performance standards will allow different materials and designs to be used and specified in permits as site-specific considerations.

Today's rule amends the requirements for bottom liners at surface impoundment and landfill units to require owners and operators of units subject to today's rule to use a composite bottom liner instead of a compacted-soil bottom liner allowed by the interim statutory design. The composite bottom liner required by today's rule specifies that the upper component of the bottom-liner must consist of a geomembrane, and the lower component of the bottom-liner must consist of a minimum of 3 feet of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} cm/sec. The compacted soil component must be able to minimize hazardous constituent migration in the event of a breach in the geomembrane.

In the March 28, 1986 proposal, EPA offered two options for the bottom liner of the double-liner system. One option corresponded to a compacted soil liner with a maximum hydraulic conductivity of 1×10^{-7} cm/sec and sufficient thickness (minimum 3 feet) to prevent hazardous constituent migration through the liner during the active life and post-closure care period (51 FR 10710). The other proposed option was the composite liner specified in today's rule, consisting of a top component that would prevent hazardous constituent migration into the top component (a geomembrane) and a bottom compacted-soil component with a maximum hydraulic conductivity of 1×10^{-7} cm/sec and the preamble to the proposal recommended a minimum thickness of 3 feet (90 cm).

EPA received comments supporting both bottom liner options. Several commenters argued that the compacted soil bottom liner, coupled with the leachate collection and removal system between the top and bottom liners, would provide adequate protection of the environment. Some of these commenters also proposed the use of a composite top liner with a compacted soil bottom liner. Others supported the use of composite bottom liners as the design best able to enhance leachate detection, collection, and removal efficiency of the leachate collection and removal system between the liners. Several commenters favored the promulgation of performance standards in the rule and the specification of designs and materials in accompanying guidance documents.

After the proposal, EPA compiled information and data on performance of these two bottom liner systems with respect to maximizing leachate detection, collection, and removal, and preventing hazardous constituent migration out of the unit. The liners were evaluated based on leachate collection efficiency, leak detection capability, and leakage through the bottom liner. Results from computer simulations and engineering calculations showed that, on a comparative basis, the composite bottom liner will perform significantly better than the compacted soil liner with respect to the three criteria. The results were summarized in the April 17, 1987 Notice of Availability of Information (52 FR 12566–12575), with more detailed discussion of the calculations and analytical approach contained in the "Bottom Liner Performance in Double-Lined Landfills and Surface Impoundments" (EPA/530–SW–87–013). In the May 29, 1987 proposed rule on leak detection systems, the Agency indicated that it was likely to finalize a rule on double liners that would require a composite bottom liner as the generally applicable standard (52 FR 20251).

EPA also conducted a review of applications submitted for RCRA hazardous waste facility permits between November 8, 1984 and February 1987 to determine the type of bottom liner selected for installation at new landfills and surface impoundments. Of some 183 units for which permit applications were submitted as of February 1987, only seven units were to be constructed with compacted soil bottom liners. The vast majority of owners or operators selected the composite bottom liner rather than a compacted soil bottom-liner. More recent data available to EPA also confirms that the majority of owners and operators are using composite bottom-liners in their designs of hazardous waste surface impoundment and landfill units (Supporting Document #3 "Compilation of Current Practices of Land Disposal Facilities," 1992).

In summary, today's rule requires composite bottom liners, based on: (1) Available information that composite bottom-liners perform significantly better than compacted soil liners in terms of maximizing leachate detection, collection, and removal, and preventing hazardous constituent migration out of the unit; and (2) evaluation of current hazardous waste industry practices.

Consistent with existing requirements for single liners at surface impoundments and landfills, today's rule in §§ 264.221(c)(1)(ii), 264.301(c)(1)(ii), 265.221(a), and 265.301(a) requires that each liner that is included in the unit's design must be chemically resistant to the waste, placed on a structurally stable foundation, and large enough to cover all areas likely to be exposed to the waste.

Double liner systems must be constructed of materials that have appropriate chemical properties and sufficient strength and thickness to prevent failure due to pressure gradients (including status head and external hydrogeologic forces), physical contact with the waste or leachate to which they are exposed, climatic conditions, the stress of installation, and the stress of daily operation. The liners must be placed upon materials capable of providing support to the liners and resistance to pressure gradients above and below the liners to prevent failure of the liners due to settlement, compression, or uplift. They must also be installed to cover all surrounding earth likely to be in contact with the waste or leachate.

2. Technical Standards for Leak Detection Systems

EPA is today establishing design standards for the leak detection systems for new landfills, surface impoundments, and waste piles, and replacements and lateral expansions of these units (§§ 264.221(c)(2), 264.251(c)(3), 264.301(c)(3), 265.221(a), 265.254(a), and 265.301(a)). These leak detection standards are designed to detect a leak through the top liner at the earliest of practicable time. Today's final rule also establishes the following design criteria for leak detection system drainage layers for affected landfills, surface impoundments, and waste piles: (1) A minimum bottom slope of 1 percent; (2) a minimum thickness of 1 foot and a minimum hydraulic conductivity of 1×10^{-2} cm/sec for granular materials used for the drainage layer for waste piles and landfills and 1×10^{-1} cm/sec

for granular materials used in surface impoundments; (3) a minimum hydraulic transmissivity of 3×10^{-5} m²/sec for synthetic materials used in drainage layers for waste piles and landfills and 3×10^{-4} m²/sec for synthetic drainage materials used in surface impoundments; and (4) sump design and operating requirements.

Location of leak detection systems. EPA proposed in the May 29, 1987 preamble (52 FR 20229) that the leachate collection and removal system adjacent to and below the top liner and above the bottom liner be designated as the leak detection system, but requested comments on the proper location of the leak detection system in a system with more than two liners. Commenters on this aspect of the rule stated that the leak detection system should be located immediately above the bottom liner. These comments claimed that specifying additional leachate collection and removal systems above the bottom liner as leak detection systems would create a regulatory disincentive for owners and operators to design systems with more than two liners by requiring these additional (intermediate) leachate collection and removal systems to meet the requirements for leak detection systems and to implement response actions in accordance with the unit's response action plan. As a result of these comments, EPA is today specifying that the leak detection system is the leachate collection and removal system drainage layer located immediately above the bottom composite liner. Under today's final rule, any additional leachate collection and removal systems located above the leak detection system are not required to meet the design and performance standards for leak detection systems.

Leak detection time. The design standards being promulgated today for leak detection systems will ensure that these systems meet the requirement in section 3004(o)(4) of RCRA for the detection of leaks of hazardous constituents at the "earliest practicable time". EPA has interpreted the term "earliest practicable time" to be the time lapse from the time a liquid has passed through a breach in the top liner to the time a technology-based leak detection system can detect the liquid, assuming saturated, steady-state flow. Without these simplifying assumptions, modelling flow rates in the leak detection system is difficult given the complexity and uncertainty of fluid flow under unsaturated conditions. After careful consideration of public comments on the proposal, EPA has decided not to specify 1 day (i.e., 24 hours) as the earliest practicable time for the detection of a leak through the top liner.

Commenters on the proposed 1-day leak detection time requirement argued that it was unnecessary and overly restrictive. Another commenter stated that the detection time could not be verified by field measurements. EPA agrees with the commenters that the proposed 1-day leak detection time requirement is unnecessary given that the Agency is promulgating minimum design specifications for leak detection systems. In addition, the Agency acknowledges that field measurement of leak detection times is a problem. EPA has determined that a leak detection system meeting today's design requirements will be capable of detecting leaks "at the earliest practicable time" consistent with the statutory mandate. Therefore, EPA is simplifying the rule by deleting the 1-day performance standard.

Leak detection sensitivity. EPA is also not finalizing the proposed leak detection sensitivity value of 1 gallon per acre per day (gpad) that was proposed. When developing a leak detection sensitivity performance standard for the May 29, 1987 proposed rule, EPA conducted comparative studies between the performance of composite bottom liners versus compacted soil bottom liners (Background Document "Bottom Liner Performance in Double-Lined Landfills and Surface Impoundments", 1987). These studies showed that composite bottom liners have a much more sensitive leak detection capability than do compacted soil-only bottom liners. For example, a compacted soil liner with a hydraulic conductivity of 1×10^{-7} cm/sec will allow some liquid migration into the liner; as a result, a simple, one-dimensional theoretical model predicts that a leak will not be detected until the flowrate through the top liner is approximately 80 gpad. In contrast, simple, one-dimensional theoretical models predict that the leak detection sensitivities of landfills and surface impoundments with composite bottom liners similar to those required in today's rule range from 0.001 to 0.1 gpad. Because EPA is today stipulating the use of a composite bottom liner, the Agency is confident that lower leak detection sensitivities will be achieved for all units affected by today's rule. Consequently, a separate requirement for leak detection sensitivity is no longer necessary and EPA has dropped this requirement from the final rule.

Slope. EPA is today finalizing a minimum slope requirement for the leak detection system. After further consideration of the slope requirement, the Agency has determined that a minimum 1 percent slope will provide adequate drainage at land disposal units at which proper construction quality assurance is used to minimize settlement (§§ 264.221(c)(2)(i), 264.251(c)(3)(i), 264.301(c)(3)(i), 265.221(a), 265.254(a), and 265.301(a)). The purpose of the requirement is to promote good drainage in the leak detection systems of units affected by today's rule. This slope requirement applies to all planar components of the leak detection system.

In the May 29, 1987 proposed rule, EPA proposed a 2-percent minimum slope but requested comments on whether the minimum bottom slope should be increased to a value between 2 and 4 percent. One commenter preferred that a 3-percent bottom slope be used to account for settlement in the final slope value. However, most commenters argued that the minimum should not be above 2 percent, expressing opposition to raising the minimum slope value above 2 percent. Many of these commenters pointed out that other improvements included in the proposed rules, such as construction quality assurance and an increased transmissivity value for synthetic drainage materials, would obviate the need for a slope greater than two percent. One commenter argued that slopes of less than 2 percent should be allowed for certain circumstances provided that the leak detection system meets other minimum design criteria and performance goals and the owner or operator can demonstrate that post-construction settlement/consolidation will be minimized or eliminated. The Agency agrees that with good CQA a lesser slope can be adequate.

Based on these comments, EPA carefully evaluated the minimum bottom slope requirement for today's rule. EPA recognizes that slope is one of several factors that will affect the performance of the leak detection system. For example, the hydraulic conductivity of materials used in the drainage system is important. In addition, the appropriate minimum slope required will also depend on the spacing of leachate collection laterals in the leak detection system; closer spacing will allow for a flatter slope. All of these design factors should be considered in selecting the appropriate slope for the system.

EPA agrees with commenters that today's rule sets in place improvements that affect the minimum slope that is needed to construct an effective leak detection system. First, the new

requirement to install a composite bottom liner provides a smooth impermeable base on which to install the leak detection system. The decreased permeability of the composite bottom liner over that of a soil liner required under previous regulations allows for a reduced slope while at the same time continuing to promote good drainage. Second, today's enhanced construction quality assurance requirements enable owners or operators the flexibility to build a flatter slope by maintaining consistent drainage without significant ponding of liquids. In addition, some of the new, rapidly draining synthetic draining materials promote more rapid drainage on flatter slopes.

Because of these improvements, EPA believes that minimum bottom slopes of less than 2 percent should be allowed where the owner or operator uses proper construction quality assurance to minimize settlement and resultant ponding of any leachate, as required by §§ 264.19 and 265.19 of today's rule. Such construction quality assurance should include surveying and other inspection techniques to measure the horizontal and vertical alignment of the bottom slope to minimize ponding and ensure leachate flow to the sump. Some owners or operators may elect to design leak detection systems using bottom slopes of greater than 1 percent. EPA emphasizes that the requirements promulgated today are minimum technical standards; owners and operators can always adopt more stringent designs at their discretion.

Thickness of granular drainage layer. Today's rule also requires that a granular drainage layer be a minimum of 12 inches in thickness for use in leak detection systems of new and replacement landfills, surface impoundments, and waste piles, and for lateral expansions of these units (§§ 264.221(c)(2)(ii), 264.251(c)(3)(ii), 264.301(c)(3)(ii), 265.221(a), 265.254(a), and 265.301(a)). EPA received no comments on this requirement in the May 29, 1987 proposed rule, and therefore is finalizing the 12-inch thickness requirement as proposed. The purpose of this minimum thickness is to decrease the chance that the underlying geomembrane will be damaged by equipment during placement of the drainage material. Current equipment used to install granular layers can only place drainage material to an accuracy of a few inches. The Agency is concerned that if granular drainage layers are designed to less than 12 inches, this equipment could damage underlying liners in areas where the drainage material is thin.

Further, this requirement for granular layer thickness is consistent with current EPA policy. A 12-inch granular layer thickness is specified in current Agency guidance (Background Document "Draft Minimum Technology Guidance Document on Double Liner Systems", 1985). In addition, a recent EPA evaluation of existing hazardous waste land disposal units (Background Document "Compilation of Current Practices at Land Disposal Units", January 1992) showed that 24 out of 28 landfills, surface impoundments, and waste piles with granular drainage layers, had a specified thickness of 12 inches.

Hydraulic conductivity of granular drainage materials. EPA proposed to require that granular materials used in leak detection systems have a minimum hydraulic conductivity of 1 cm/sec. The Agency contended that greater permeability afforded by granular materials having 1 cm/sec hydraulic conductivity was necessary to minimize capillary tensions present in leak detection system granular materials and to satisfy the proposed leak detection time performance standard of 1 day.

EPA requested and received comments on the proposed hydraulic conductivity requirement. Commenters opposed the 1 cm/sec requirement for several reasons. Several commenters stated that the requirement would force them to use rounded gravels or other granular materials meeting the hydraulic conductivity value. These commenters maintained that such materials were either not available or only available at significantly higher costs in many areas of the country. One commenter suggested that EPA should provide a variance to owners or operators in areas where suitable granular drainage materials having the proposed hydraulic conductivity are unavailable. Another commenter stated that the Agency should continue to require granular materials to have minimum hydraulic conductivities of 1×10^{-2} cm/sec as currently specified in EPA guidance. This commenter asserted that sand, which is the most common granular material used in leak detection systems, generally has a hydraulic conductivity of 1×10^{-2} cm/sec. Other commenters argued that using granular materials with hydraulic conductivities on the order of 1 cm/sec would significantly increase the susceptibility of geomembranes (above and below the drainage layer) to puncture, because it would be difficult to remove angular materials from the materials used to construct the drainage layer. Another commenter argued that by requiring granular materials to have a 1 cm/sec hydraulic conductivity, EPA was forcing owners or operators to use synthetic drainage materials that are incompatible with many materials used for synthetic liners.

The Agency acknowledges that the availability of granular materials meeting the proposed hydraulic conductivity requirement may be limited. The Agency is also concerned with the greater potential for geomembranes to be damaged from the use of granular materials having hydraulic conductivities of 1 cm/sec. In response to the commenters concerns, the final rule (§§ 264.221(c)(2)(ii), 264.251(c)(3)(ii), 264.301(c)(3)(ii), 265.221(a), 265.254(a), and 265.301(a)) requires that granular materials used in leak detection systems at waste pile and landfill units subject to today's rule have a minimum hydraulic conductivity of 1×10^{-2} cm/sec consistent with current Agency guidance. However, the final rule specifies that granular materials used in leak detection systems at surface impoundments subject to today's rule must have a minimum hydraulic conductivity of 1×10^{-1} cm/sec.

The Agency has determined that granular materials used in leak detection systems at surface impoundments must have a higher hydraulic conductivity (one order of magnitude greater than what is currently specified by Agency guidance) to account for the potentially greater hydraulic heads imposed on the top liner in surface impoundments. Surface impoundments are typically used to manage liquids, therefore the hydraulic heads on the liner systems of these units are often much higher than those in waste piles and landfills, which are not allowed to manage wastes containing free liquids and must have a leachate collection system above the top liner. Consequently, if a leak occurs in the top liner of a surface impoundment, and is not rapidly drained to the detection sump, areas of the bottom-liner system will potentially be subjected to hydraulic heads in excess of one foot, increasing the probability of migration of hazardous constituents out of the unit. A greater permeability in the leak detection system will drain any leak more rapidly and thus reduce the head on the bottom liner system. Although granular materials having hydraulic conductivities of 1×10^{-1} cm/sec will typically be coarser sands and fine gravels, the Agency feels that two common construction techniques can be

used in combination to prevent any damage to geomembranes adjacent to the drainage materials. First, facilities may select rounded drainage materials; these materials are less likely to puncture or otherwise damage geomembranes. Second, owners or operators may use additional layers of synthetic materials (e.g., a needle-punched nonwoven geotextile) next to the liner to provide a cushion for the drainage materials and reduce the probability of puncturing. In addition, today's construction quality assurance requirements help to assure against such punctures.

The Agency's recent evaluation of current industrial practices (see "Compilation of Current Practices at Land Disposal Facilities", January 1992) revealed that many facilities are selecting synthetic drainage materials, such as geonets, for their leak detection systems. Synthetic drainage materials are often selected instead of granular materials because they typically require less space and are easier to install than granular materials. Also, as discussed below, virtually all synthetic drainage materials have permeabilities greater than 10^{-2} cm/sec.

Transmissivity of synthetic drainage materials. EPA proposed a minimum transmissivity value of 5×10^{-4} m^2/sec for synthetic drainage materials that are used in lieu of granular drainage materials. This value was selected because it provides equivalent drainage capacity to that of a granular drainage layer meeting the requirements of the proposed rule; that is, 12 inches of a granular drainage layer with a hydraulic conductivity of 1 cm/sec. The minimum value of 5×10^{-4} m^2/s for hydraulic transmissivity was based on numerical simulations of typical leak detection systems. In these simulations, EPA considered a range of synthetic drainage materials, including nets, mats, and waffles. From the results of these simulations ("Liner and Leak Detection Rule Background Document", 1987), EPA concluded that a hydraulic transmissivity value of 5×10^{-4} m^2/sec would enable the leak detection system to collect and remove relatively large amounts of leakage while maintaining gravity flow conditions. This specification was to ensure that the liquids in the leak detection system would be rapidly collected while the hydraulic head on the bottom liner would be minimized.

One commenter objected to the transmissivity standard, claiming that a value of 5×10^{-4} m^2/sec is not achievable with a single layer of currently available netting, and that performance may be worse when creep, loading, and rib layover come into effect. EPA disagrees. The Agency has data (Liner and Leak Detection Rule Background Document, 1987) showing transmissivities of single layers of synthetic drainage materials produced by four major manufacturers under the conditions of ASTM Test Method D 4716-87 (that is, a pressure of 100 kilopascals (kPa) and a hydraulic gradient between 0.1 and 0.25). At the time of the proposal, these transmissivities ranged from approximately 2×10^{-4} m^2/sec to 4×10^{-4} m^2/sec. Improvements in geonets since then have resulted in typical transmissivities of 2×10^{-3} to 4×10^{-3} m^2/sec using the same ASTM test method. The Agency maintains that the conditions at which ASTM D 4716-87 is conducted are representative of the pressures and hydraulic gradients in many land disposal units, and as a result, a transmissivity value of 5×10^{-4} m^2/sec can be obtained with typical commercially available synthetic drainage materials. However, the Agency recognizes that the requirements for synthetic drainage materials should be consistent with the requirements for granular drainage systems in leak detection systems. Thus, the Agency has revised the transmissivity requirements in today's rule (§§ 264.221(c)(2)(ii), 264.251(c)(3)(ii), 264.301(c)(3)(ii), 265.221(a), 265.254(a), and 265.301(a)) to require that synthetic drainage materials achieve equivalent flow rates to drainage layers utilizing granular materials.

Other performance requirements. Today's final rule also includes several general performance standard requirements for leak detection systems that are simply restatements of what is already required in existing regulations for leachate collection and removal systems at surface impoundments, waste piles, and landfills subject to today's final rule. Under today's rule, leak detection systems for affected units must be constructed of materials that are chemically resistant to wastes and leachate in the unit, and be of sufficient strength to resist pressure gradients generated within the unit (§§ 264.221(c)(2)(iii), 264.251(c)(3)(iii), 264.301(c)(3)(iii), 265.221(a), 265.254(a), and 265.301(a)). These requirements are designed to ensure that leak detection systems are not damaged from chemical and physical stresses associated with the unit. Also, these requirements are simply an extension of the performance standards for liners.

Leak detection systems for units regulated under today's rule must also be designed and operated to minimize clogging during the active life and post-closure period (§§ 264.221(c)(2)(iv), 264.251(c)(3)(iv), 264.301(c)(3)(iv), 265.221(a), 265.254(a), and 265.301(a)). This requirement is to ensure that drainage in leak detection systems is not impeded over time. EPA is concerned about the potential for drainage layers to become clogged as a result of physical, chemical, or biological mechanisms. EPA data indicate that the potential for clogging increases as the hydraulic conductivity of drainage material decreases. Examples of techniques to minimize clogging include: Using properly graded granular filter materials, filter fabrics (geotextiles), or other filter materials to reduce fines; using poorly graded (i.e., uniform) granular drainage material; increasing collection pipe slot numbers or size; reducing liquid residence time by increasing slope, decreasing pipe spacing, or increasing the size of granular drainage material; and cleaning collection system pipes and drainage media using hydraulic jetting, steam, or acidic solutions.

In addition, today's rule requires that leachate collection and removal systems immediately above the top liner (for landfill and waste pile units) be capable of ensuring that the leachate depth over the top liner does not exceed 1 foot (30 cm) as proposed in the March 28, 1986 proposed rule. EPA received no comments on these requirements and is therefore finalizing them as proposed.

EPA is today also promulgating several requirements for sumps that are part of a leak detection system. Owners or operators of new and replacement landfills, surface impoundments, waste piles, and lateral expansions of such units must use sumps of sufficient size to collect and remove liquids efficiently and prevent these liquids from accumulating on the drainage layer. In addition, the design of the sump and removal system must provide a method for measuring and recording the volume of liquids present in the sump and of liquids removed. EPA received no comments on these requirements and is therefore finalizing them as proposed (§§ 264.221(c)(2)(v), 264.251(c)(3)(v), 264.301(c)(3)(v), 265.221(a), 265.254(a), and 265.301(a)).

EPA is today promulgating a requirement for owners or operators of units affected by today's rule to collect and remove pumpable liquids in leak detection sumps to minimize the head on the bottom liner (§§ 264.221(c)(3), 264.251(c)(4), 264.301(c)(4), 265.221(a), 265.254(a), and 265.301(a)). The Agency had proposed, in the May 29, 1987

Federal Register, that the head in the sump for the leak detection sump be minimized; in the preamble, the Agency suggested that the average liquid levels in the sump should be below 12 inches. One commenter on the proposed rule stated that the 12-inch maximum was unachievable in many instances because of the size and geometry of most sumps and the pumps used to empty them. The commenter also mentioned that automated level control systems and minimum submergence requirements make the 12-inch maximum level an impossible performance standard. EPA agrees that the geometry of sumps may vary and that minimum pumping levels may be greater than 1 foot. Thus, the Agency is not setting a maximum level of liquids in the sump, but specifying only that the head on the bottom liner must be minimized by requiring owners and operators to remove pumpable liquids from the sump. "Pumpable liquids" means any amount of liquids that can be reasonably pumped out of the sump, based on sump dimensions, pump operating levels for automated pump systems, and the goals of minimizing head in the sump and backup of liquids (from the sump and drainage tile or pipes) into the drainage layer.

Today's rule also modifies the definition of the term "sump" in § 260.10 to redefine sumps used as part of leak detection systems for waste piles, surface impoundments, and landfills. The purpose of this modification is to make clear that the regulations for hazardous waste tanks that are otherwise applicable to certain sumps do not apply to those sumps used at land disposal units that function as part of the leak detection system. These sumps serve fundamentally different purposes than many other types of sumps. Sumps used at land disposal units are usually surrounded by one or more liners; therefore, many requirements, especially secondary containment, are not practicable for these units. The Agency maintains that subjecting these units to the requirements for hazardous waste tanks will not provide a substantial environmental benefit and has therefore modified the definition of the term sump to redefine sumps used as part of leachate collection and removal or leak detection systems for surface impoundments, waste piles, and landfills.

Finally, today's rule includes a requirement applicable only to those leak detection systems installed at new, replacement, or lateral expansions of landfills, surface impoundments, and waste piles that are not located above the seasonal high water table. EPA received no comments on this requirement and is finalizing it as proposed. The Agency is therefore requiring in today's rule that owners or operators of leak detection systems not located completely above the seasonal high water table demonstrate that the operation of the leak detection system will not be adversely affected by the presence of ground water (§§ 264.221(c)(4), 264.251(c)(5), 264.301(c)(5), 265.221(a), 265.254(a), and 265.301(a)).

3. Alternative Systems

Alternative designs. The existing rules (§§ 264.221(d), 264.251(b), 264.301(d), 265.221(c), and 265.301(c)) already provide for alternative designs to the liners and leachate collection and removal systems if an owner or operator can demonstrate that an alternative design will prevent the migration of any hazardous constituent into the ground water or surface water at least as effectively as the requirements in §§ 264.221(c), 264.251(a), and 264.301(c), as appropriate. Today's rule adds §§ 264.221(d), 264.251(d), 264.301(d), 265.221(a), 265.254(a), 261.301(a) to allow alternative designs for leak detection systems that are capable of detecting leaks of hazardous constituents at least as effectively as the new leak detection system requirements in §§ 264.221(c)(2), 264.251(c)(3), 264.301(c)(3), 265.221(a), 265.254(a), and 265.301(a). EPA feels that variance procedures allow owners or operators flexibility in designing their leak detection systems without discouraging the use of new leak detection systems.

In order to be granted a variance from the leak detection requirements of today's final rule, an owner or operator must demonstrate to the Regional Administrator that the proposed design detects leaks through the top liner at least as effectively as a leak detection system designed to meet today's minimum design standards. In deciding whether to allow a variance for an alternative leak detection system or technology, the Regional Administrator will consider: (1) The ability of the proposed system or technology to operate as effectively through the active life and post-closure period of the unit as a unit designed using the minimum design specifications; (2) the nature and quantity of the wastes to be managed in the unit; and (3) the ability of the system to detect leaks, and in combination with response actions to be taken upon discovery of leakage, prevent migration of hazardous constituents out of the unit during the active life and post-closure care period. For example, an alternative leak detection system that did not provide information about leakage until after the leakage migrated through the bottom liner would be deemed unacceptable, because such a system would trigger an owner or operator response after hazardous constituents migrated into the environment.

Owners or operators may apply for a variance if they wish to propose a leak detection system design that deviates from today's design parameters. For example, if an owner or operator specified that the drainage layer of a surface impoundment would utilize granular materials having a hydraulic conductivity of 1×10^{-2} cm/sec (instead of the minimum required value of 1×10^{-1}cm/sec), the owner or operator would have to describe how other components of the system (e.g., depth of impoundment, bottom slope, flow path to a collection pipe or sump or pipe spacing) or the action leakage rate or response action plan would detect leaks at the earliest practicable time, minimize head on the bottom liner, and prevent migration of potentially hazardous constituents out of the unit as effectively as the design required in today's rule.

Temporary units. In the May 29, 1987 proposal EPA invited comment about whether double liners and leachate collection systems are necessary for all waste piles, or if alternative systems might provide adequate environmental protection at some units. In response to the Agency's request, a commenter questioned whether double liner and leachate collection systems are necessary for short-term waste piles created during corrective action. The same commenter also suggested that EPA should propose an overall policy in its upcoming corrective action rule as to what technological requirements will apply to units used for corrective action.

The Agency agrees with these comments. There are circumstances where the Agency believes it should allow temporary units constructed as a part of corrective action pursuant to a permit or 3008(h) enforcement order, or an approved closure plan, to be constructed without a double liner and a leachate collection system. Due to the limited time these units are in operation, in concert with alternative design, location and operating practices, there are situations which are equally effective as double lined units in preventing migration of constituents to ground water or surface water. Many waste piles (as well as some temporary storage surface impoundments) may thus qualify for the double liner waiver

found in §§ 264.221(d), 264.251(d), 265.221(a), and 265.254(a).

These provisions provide for a generic waiver of the double liner system, but do not specifically address temporary units. In response to the special needs posed by corrective action and facility closure (e.g., rapid cleanup and short-term operation) the Agency has published a proposed "Subpart S" rule (55 FR 30798) that, among other things, specifically addresses standards for temporary units. That proposal outlines Agency guidance on what factors to consider in determining what constitutes a temporary unit.

4. Applicability to Waste Piles

EPA is requiring that new and replacement waste piles, and lateral expansions of waste piles, install, operate, and maintain double liner and leak detection systems (§§ 264.251 and 265.254). The Agency is extending the double liner and leachate collection and removal system requirements to waste piles, as discussed in the preamble to the May 29, 1987 proposal (52 FR 20250), because the Agency maintains, for several reasons, that these units pose threats similar to or greater than landfills concerning leakage through the top liner and releases of hazardous constituents. First, waste piles are often exposed to precipitation for longer periods of time than landfills. Many owners or operators of landfills provide an intermediate cover to minimize leachate generation; this practice is not as common for waste piles. Second, waste piles have a higher potential for equipment-related damage than do landfills, because equipment is frequently used to add and remove waste from piles during these units' active lives. This increased equipment activity at waste piles increases the risk of damage to the primary liner and merits use of a secondary liner for these units. Finally, waste piles typically have much longer active lives than landfills: Waste piles are typically used for 20 years or more, whereas landfill units are more common used for periods of 6 months to 5 years before being closed.

Today's rule provides a waiver from the double liner and leachate collection and removal system requirements for certain waste piles that are monofills. In the May 29, 1987 proposal rule, EPA proposed a variance for monofills when (1) the monofill contains only hazardous wastes from foundry furnace emission controls or metal casting molding sand, (2) such waste do not contain constituents which would render the wastes hazardous for reasons other than EP toxicity characteristic, (3) the monofill has at least one liner for which there is no evidence that such liner is leaking, (4) the monofill is located more than a quarter mile from an underground source of drinking water, and (5) the monofill is in compliance with generally applicable ground-water monitoring requirements for facilities with permits. The Agency proposed this waiver to codify the language in section 3004(o)(3) of RCRA and to be consistent with regulations for landfills and surface impoundments. Because EPA received no comments on this proposed waiver, it is being finalized as proposed in today's rule (§§ 264.251(e)(1) and 265.254(a)).

Today's rules do not affect the existing exemption in § 264.250(c) and now in § 265.254 for certain indoor waste piles. These units continue to be excluded from today's double-liner and leak detection requirements because they contain no free liquids and are protected from precipitation and surface water run-on and are therefore unlikely to have any leakage.

5. Applicability to Land Treatment Units

EPA proposed a number of leak detection requirements for land treatment units in the May 29, 1987 proposed rule. These requirements included (1) a 95-percent confidence level for detecting hazardous constituents in the treatment zone, (2) monitoring conducted above the seasonal high water table, (3) response action plans, and (4) inspection of unsaturated zone monitoring equipment. Today's rule does not include additional leak detection requirements for land treatment units. EPA has concluded that the current regulatory requirements for unsaturated zone monitoring at land treatment units are sufficient to ensure that leakage of hazardous constituents will be detected at the earliest practicable time. Therefore, EPA finds that additional regulations for such units are not needed to meet the statutory requirements of section 3004(o)(4) of RCRA for these units.

In the preamble to the 1987 proposal, EPA noted that unsaturated zone monitoring systems serve as effective leak detection systems for land treatment units. The Agency received no comments challenging this position or suggesting more effective alternatives. The existing regulations, however, already require unsaturated zone monitoring—i.e., leak detection systems—at all land treatment units, both new and existing. Specifically, §§ 264.278 and 265.278 contain detailed technical standards for soil and soil-pore liquid monitoring in the unsaturated zone below the land treatment unit to ensure detection of any hazardous constituents migrating out of the treatment zone. Furthermore, when releases are detected, the owner or operator of a permitted facility is required to modify operating procedures at the land treatment unit to prevent further release. EPA has implemented these requirements through two guidance documents: "Permit Guidance Manual on Hazardous Waste Land Treatment Demonstrations" and "Guidance Manual on Unsaturated Zone Monitoring for Hazardous Waste Land Treatment Units." After reviewing public comments and its experience in permitting land treatment units since the proposal, EPA concluded that the current regulatory requirements, coupled with existing guidance, are sufficient to ensure that leak detection systems in new land treatment units are capable of detecting releases at the earliest practicable time.

In the May, 1987 proposal, EPA did not propose to change the basic regulatory requirements for unsaturated zone monitoring, but added several relatively minor amendments. For example, the proposal would have added a requirement that constituents migrating out of the treatment zone be detected at a 95% confidence level and that the unsaturated zone monitoring take place above the seasonal high water table as well as below the treatment zone (as the current standards specify). EPA has concluded that these minor changes are unnecessary, either to meet the statutory standard or to protect human health and the environment. Available guidance documents already specify a 95% level of confidence for monitoring, and EPA and the States have successfully incorporated this standard into permits. Therefore, it is unnecessary to impose this requirement as a matter of regulation. Similarly, monitoring below the seasonal high water table is already prohibited by the existing regulations, because monitoring below the water table would not qualify as unsaturated zone monitoring. Therefore, the regulatory requirement that the monitoring be above the seasonal high water table is also unnecessary.

Today's final rule also does not finalize requirements for a response action plan describing remedial action if releases are detected in the unsaturated zone. EPA has concluded that a response action plan for permitted land treatment units is superfluous, because the current regulations (§ 264.278(g)) already require facility owners or operators to take specific responses in the case of hazardous constituents detected in the unsaturated zone monitoring system. EPA also notes that

migration found in the unsaturated zone monitoring system would constitute migration from the unit, and therefore could be addressed by the Agency, if necessary, under RCRA corrective action requirements. Finally, EPA notes that, because of the RCRA land disposal restrictions, most if not all hazardous waste land treatment units in the future will be able to operate only if wastes placed in them meet applicable treatment standards before placement in the unit or if they are granted a no-migration variance. A unit granted a no-migration variance that then releases hazardous constituents from the unit would have to cease receipt of prohibited wastes (§ 268.6(f)). In this case, a unit found to be releasing hazardous constituents to the unsaturated zone would be required to cease operating. For these reasons, EPA has concluded that a response action plan is not necessary for land treatment units.

A December 6, 1991 decision of the United States Court of Appeals, District of Columbia addressed the soil-pore water monitoring requirements for interim status land treatment facilities (*Shell Oil Company v. EPA*, No. 89-1532). As of the date of this rule, the Court's mandate was not yet issued and the regulation remains in place. The Agency is still considering what response to take to the Court's decision.

C. Response to Leaks

1. Action Leakage Rate

The final rule requires owners or operators to establish one action leakage rate (ALR) for each unit affected by today's rule (§§ 264.222, 264.252, 264.302, 265.222, 265.225, and 265.302). The action leakage rate is a leakage rate that requires implementation of a response action to prevent hazardous constituent migration out of the unit. The Agency has determined, the public comments support, the need for an ALR and response actions that the ALR triggers. EPA believes that the ultimate goal of the liner and leak detection system requirements is to prevent the release of hazardous constituents from the unit, thereby protecting the ground water and surface water. A system in place to detect leaks at the earliest practical time should be complemented by early follow-up actions to effectively minimize the chance for migration of hazardous constituents from the unit. Furthermore, it is often more effective to address leaks within the liners than to later address ground-water contamination through corrective action.

Today's final rule requires owners or operators to monitor the rate of leakage into the leak detection sump and to determine whether the measured rate of leakage over a specified period of time exceeds the action leakage rate (see Section IV.D. of the preamble for further discussion of today's monitoring requirements). If the owner or operator determines that the measured rate of leakage exceeds the ALR, the owner or operator must notify EPA and implement procedures contained in a response action plan that owners or operators must prepare for units affected by today's rule.

The proposed rule allowed the owner or operator a choice in establishing an action leakage rate. EPA proposed to specify an action leakage rate between 5–20 gallons/acre/day (gpad). Alternatively, the owner or operator could propose a site-specific action leakage rate for EPA approval. The proposed rule required owners and operators to develop and submit a plan for responding to the action leakage rate.

The proposed rule also required owners and operators to establish a value and a response action plan for a rapid and large leakage rate (RLL). The RLL was defined as the maximum design leakage rate (plus a safety factor) that the leak detection system can remove under gravity flow conditions (i.e., without the fluid head on the bottom liner exceeding one foot in granular leak detection systems and without the fluid head exceeding the thickness of synthetic lead detection systems). EPA also considered in the proposal the possibility of owners or operators developing responses to leakage rates between the action leakage rate and rapid and extremely large leakage rate (referred to as an intermediate leakage rate). In addition, the Agency considered requiring owners or operators to develop responses to "significant changes" in the flow rate (EPA suggested a 100 gpad or 25–50 percent increase, whichever was larger), leakage that exceeded health-based concentrations of hazardous constituents, and a leakage rate exceeding 50 gpad for any one-day period. In summary, EPA discussed six leakage rates in the proposal that could trigger various response actions by owners or operators.

Although no commenters objected to the establishment of an action leakage rate, EPA received many comments on the proposed action leakage rate value. Several commenters favored EPA setting an action leakage rate within the proposed range of 5–20 gpad. Some suggested that EPA should not finalize a specific value within the proposed range, but keep the range of 5–20 gpad and allow the permit writer to select a specific value within the range to apply to the unit. Some commenters suggested an action leakage rate of 50 or 100 gpad. Another commenter suggested that EPA set an action leakage rate at 75 percent of the proposed rapid and extremely large leakage rate. One commenter stated that the action leakage rate should be decreased over the life of the unit according to a formula, thus allowing a higher action leakage rate during initial operation of the unit to account for presence of liquids in the sump from sources other than leaks (e.g., construction water).

In general, most commenters stated that EPA had little or no field data to set an action leakage rate within the proposed range, and argued that the Agency should allow site-specific action leakage rates to be set by the permit writer, especially to account for other potential sources of liquids in the leak detection sump (e.g., soil liner construction water, precipitation during construction, and ground-water infiltration). Although the proposed rule would allow site-specific variances to the proposed action leakage rate, commenters expressed concern that EPA would not allow many site-specific action leakage rates. These commenters claimed that site-specific action leakage rates based on the design and operation of the unit should be common.

EPA also received many comments on other leakage rates that would require owners or operators to develop response actions. Commenters opposed using "significant changes" in the flow rate or health-based concentrations of hazardous constituents in liquids entering the detection sump to trigger a response by the owner or operator. Commenters felt that the proposed "significant change" concept was unclear and difficult to define. Commenters felt using leachate quality analysis at flow rates below the rapid and extremely large leakage rate to trigger a response was costly, time-consuming, and provided no additional environmental benefit. These commenters generally felt that liquid flow rates into the detection sump should be the sole trigger of an owner or operator's response. Many of these commenters also disagreed with the use of health-based levels (e.g., maximum contaminant levels) in the leachate to trigger a response. They argued that EPA's assumptions in proposing such levels were overly conservative and unrealistic because such liquid was still contained in the leak detection system and migration to the environment was

controlled by the bottom-liner and drainage system.

Many commenters maintained that EPA was proposing too many leakage rates without a clear distinction between them as to the differences in response associated with the leakage. These commenters claimed that some of the responses actions discussed by EPA in the preamble seemed to be redundant for different leakage rates, and that EPA's requirements were confusing, burdensome, and provided no additional benefit. As an example, the commenters cited that flow rates above the proposed action leakage rate (5–20 gpad) would trigger many of the same responses that exceedance of other leakage rates, such as the rapid and extremely large leakage rate (an example in the preamble showed a RLL of 3000 gpad) or significant change in leakage rate, would mandate. Some of these commenters stated that leakage rates less than the rapid and extremely large rate did not necessarily indicate a failure of the top liner, and that leakage would still be contained within the unit by the bottom liner. Therefore, they felt that the Agency should not stipulate excessive and redundant responses on the part of owners or operators for leakage rates that do not pose environmental concerns.

EPA requested and received field data on actual leakage rates from commenters on the proposed rule, and obtained additional data from more recent studies of leakage rates through top liners at land disposal units. However, these data are limited and furthermore, indicate that a portion of units (>25%) with CQA could exceed 20 gpad, the highest end of the proposed range for action leakage rates. Therefore, the Agency agrees with commenters that existing field data do not support establishment of an action leakage rate within the proposed range of 5–20 gpad for all units.

In response to EPA's request for comments on the appropriateness of the proposed range for surface impoundments, commenters argued that it was inappropriate for the Agency to set the same action leakage rate for landfills and surface impoundments and that the Agency should take into account the type, size, and operation of the unit when establishing an action leakage rate. EPA agrees with the commenters that the size, type, and operation of the unit should be accounted for in establishing a leakage rate that will trigger a response by the owner or operator, and that a standard leakage rate value for all units is not appropriate at this time.

In addition, EPA acknowledges commenters' concerns about the proposed number of leakage rates triggering a response by the owner or operator, and the lack of distinction among them for purposes of implementation. To simplify the final rule, EPA has chosen to establish one leakage rate that will trigger a response by the owner or operator, account for the site-specific design of the unit, and indicate significant evidence that there is problematic leakage through the top liner that mandates a response. EPA is requiring owners or operators to propose an action leakage rate for each unit subject to today's rule based on an approach that is similar to the proposed definition of the rapid and extremely large leakage rate. That is, owners or operators must calculate an action leakage rate based on the maximum design leakage rate that the leak detection system can remove without the fluid head on the bottom liner exceeding one foot. This leakage rate must account for an adequate margin of safety for uncertainties in design, construction, and operation of the leak detection system. The action leakage rate must not be greater than the flow capacity of the drainage layer in order to assure detection of leaks (e.g., if the ALR is 500 gpad and the flow capacity is 400 gpad then the ALR would never be exceeded no matter how large the leak). The action leakage rate should always be less than or equal to the pumping capacity of the leak detection sump since the pumping capacity is required to be greater than the maximum leak detection system flow rate under which gravity flow conditions prevail (i.e., to prevent liquids from backing up into the drainage layer). If the owner or operator determines that the action leakage rate is exceeded, the owner or operator must implement the procedures contained in the response action plan.

EPA believes that flow rates in excess of the action leakage rate indicate a major localized or general failure of the top liner, thus increasing the potential for a buildup of head on the bottom liner and increasing the potential for migration of hazardous constituents into the bottom liner. For this reason, it is necessary to maintain leak detection flow rates below the action leakage rate and for the owner or operator to take response actions for leaks greater than the action leakage rate.

Under today's rule, as in the May 29, 1987 proposal, the owner or operator must propose an action leakage rate based on calculations of the maximum flow capacity of the leak detection system design so as not to exceed one foot head on the bottom liner (called rapid and extremely large leak in the proposal). The proposal background document "Liner and Leak Detection Rule Background Document", (EPA/530–SW–87–015, May 1987) presented a number of mathematical models for making such a determination. All of these models are based on Darcy's Law for non-turbulent flow through saturated media. Of these models, the Agency finds that the following formula for flow originating through a hole in the liner is the most likely leak scenario for a geomembrane liner:

$$Q = k.h.\tan\alpha.B$$

where

Q = flow rate in the leak detection system (drainage layer),
h = head on the bottom liner,
k = hydraulic conductivity of the drainage medium,
α = slope of the leak detection system,
B = width of the flow in the leak detection system, perpendicular to the flow.

Using this formula, the Agency calculated the maximum flow rates using the minimum specifications in today's rule: 1% slope, and 1×10^{-1} cm/sec hydraulic conductivity for surface impoundments and 1×10^{-2} cm/sec hydraulic conductivity for landfills and waste piles. Assuming that the head is 1 foot and the width of flow (B) is 100 feet, the results show maximum flow rates of 2,100 gpad for surface impoundments and 210 gpad for landfills and waste piles. Using a safety factor of two, as suggested in the proposed rule preamble, yields about 1,000 gpad for surface impoundments and 100 gpad for landfills and waste piles as the Agency recommended action leakage rates. Because this calculation used the minimum technical requirements and other design assumptions to maximize potential head on the bottom liner, the Agency believes that the units meeting the minimum technical requirements would not require action leakage rates below 100 gpad for landfills and waste piles and 1000 gpad for surface impoundments. The final background document on action leakage rates ("Action Leakage Rates for Leak Detection Systems," January 1992) provides further discussion and background on these recommended action leakage rates. As discussed earlier in the preamble, this document is available from the docket for this rule or from NTIS, U.S. Department of Commerce.

While EPA recommends the above action leakage rates for the minimum design specifications, the Agency recognizes that a number of site-specific

factors affect the maximum flow capacity of a leak detection system, and owners or operators may want to propose alternative action leakage rates. For example, the leak detection system design may be different than the minimums specified in today's rule. As indicated above and in the background document, hydraulic conductivity is a factor that significantly affects the flow capacity of the system. The Agency believes that leak detection systems with greater hydraulic conductivities would have higher action leakage rates. In additional, owners or operators may have information to justify a different width of flow in the above calculation. Owners or operators also may justify a higher action leakage rate by using a different formula or model. While the Agency recommends the use of the above model for defining the maximum flow capacity of the leak detection system and action leakage rate, EPA recognizes that there may be alternative models available now or in the future that may more accurately predict system flow capacity to justify higher action leakage rates. Therefore, owners or operators may propose to use an alternative model that they believe more accurately predicts the maximum flow capacity of the leak detection system. Further, owners or operators may want to do a flow (pump) test on the leak detection system to show actual flow capacity, which may justify a higher action leakage rate. Finally, the owner or operator may have flow rate data on similarly designed units to use to justify a different level. As more and more units are built, the Agency as well as owners or operators will develop a better data base that may be used to establish appropriate action leakage rates.

For facilities seeking a permit, the action leakage rate will be set after the Regional Administrator reviews the rate proposed by the owner or operator in either the facility's part B permit application or permit modification. for interim status facilities, the owner or operator must submit a proposed action leakage rate for the affected unit to the Regional Administrator 60 days prior to the receipt of waste in the unit. The Regional Administrator will either approve, modify, or deny the proposed leakage rate. The Regional Administrator may extend the review period to evaluate the owner or operator's proposed action leakage rate for up to 30 more days. If none of these actions occur within 60 days (or if the review period is extended, within 90 days), the proposed rate can be considered approved.

Owners and operators of units affected by today's rule must monitor the leak detection sump and use the monitoring information to determine if the action leakage rate has been exceeded. The final rule sets forth the procedures owners or operators must use in determining whether the action leakage rate has been exceeded §§ 264.222(b), 264.252(b), 264.302(b), 265.222(c), 265.255(c), and 265.302(c)). To calculate the flow rate into the leak detection sump, owners, or operators must convert flow rate data into an average daily flow rate per acre (i.e., gpad) for each leak detection sump. This calculation must be performed weekly during the active life and closure period of the unit, unless the Regional Administrator approves otherwise. Upon closure (installation of the final cover for the unit), owners or operators will monitor the leak detection sump monthly, or in some cases quarterly or semi-annually (see Section IV.D. for further discussion). While on a monthly monitoring schedule, owners or operators will have to convert the monitoring data to an average daily flow rate to determine if the action leakage rate has been exceeded. If an owner or operator is monitoring quarterly or semi-annually no calculations are needed unless liquids are detected in the sump above the pump operating level, in which case the owner or operator must resume monitoring the sump on a monthly basis. Such an owner or operator would then have to convert monitoring data to an average daily flow rate per acre for the purpose of determining if the action leakage rate has been exceeded.

2. Response Action Plan

The final rule requires owners or operators of affected units to develop a response action plan for leaks exceeding the action leakage rate §§ 264.223, 264.253, 264.304, 265.223, 265.259, and 265.303). The response action plan is a site-specific plan that the owner or operator develops to address leakage through the top liner to assure that it does not migrate out of the unit. It is based on an assessment of the capability of the total design, construction, and operation of the unit rather than of individual components of the unit.

The majority of commenters on the proposed response action plan requirements stated that there were too many potential triggers (i.e.,leakage rates) that the response action plan must potentially address in the proposed rule. These commenters argued that these trigger levels lacked distinction as to the responses they would necessitate. Other commenters felt that the response action plan requirements were confusing and inconsistent in certain cases. The commenters noted that many of the response actions for leaks above the proposed rapid and extremely large leakage rate were similar to actions for leaks above the proposed action leakage rate. In response to these comments, EPA has simplified and clarified the response action requirements in today's final rule.

The final rule specifies minimum response actions that the owner or operator must take when the owner or operator determines that the action leakage rate has been exceeded. The minimum response actions are included in the response action plan that the owner or operator must prepare. Although minimum response actions are required to be in the response action plan, the content of a response action plan is determined by site-specific factors. The minimum responses required under today's rule are typical of response action plans EPA has identified at operating facilities and incorporate comments EPA received on the proposed response action plan requirements. Although today's rule only requires the owner or operator to initiate response actions upon exceedance of the action leakage rate, owners or operators may want to implement some types of response actions for leakage rates less than the action leakage rate, because these actions will lower the probability that leakage will exceed the action leakage rate and trigger today's final response action requirements.

An owner or operator's response action plan must include notifying EPA within 7 days that the action leakage rate has been exceeded. EPA received no comments on the proposed notification requirement and thus, is finalizing this requirement. The Agency is also requiring that the owner or operator submit a preliminary written assessment to the Regional Administrator within 14 days of the determination as to amount and source of the liquids in the detection sump, information on possible size, location, and cause of the leak, and any immediate and short term actions the owner or operator will take (e.g., additional pumping and removal of the leachate, changes in operating practices to reduce the leakage). As stated above, the Agency believes that exceedance of the action leakage rate is significant and indicates a major localized or general failure of the top liner, thus increasing the potential for a buildup of head on the bottom liner and increasing the potential for migration of hazardous

constituents into the bottom liner and out of the unit. For this reason, the Agency must be notified and given a preliminary assessment of the actions taken by the owner or operator.

The focus of the response action requirements for flow rates above the action leakage rate is the degree and schedule of what remediation, if any, is needed to reduce the leakage to the action leakage rate. The final rule requires that owners or operators identify the location, size, and cause of the leakage, and sample and analyze the leachate present in the detection sump. EPA believes that analyzing the leachate is necessary as part of determining the response needed to reduce the leakage to below the action leakage rate. For example, such information may be useful in locating a leak at sites where different wastes are disposed of in different cells. The owner or operators's's response action plan must discuss whether wastes should be removed to locate and repair the leak, whether repairs or controls will be used to minimize the leakage, and if so, whether operational changes, such as reduction or cessation of waste receipt, or partial or final closure of the unit, will be implemented, and if so, what types.

Today's rule clarifies when the owner or operator must submit a report documenting the response actions taken concerning leakage above the action leakage rate. The final rule requires that the owner or operator submit a report to the Regional Administrator describing how effective the response actions have been in reducing the leakage below the action leakage rate and preventing migration of hazardous constituents out of the unit within 30 days of exceeding the action leakage rate. The final rule also requires that the owner or operator continue to submit these reports monthly as long as the action leakage rate is exceeded.

EPA received several comments on the proposed response action submission and approval process. Several commenters expressed concern over possible delays associated with requiring a response action plan before receipt of waste. EPA received comments both supporting and objecting to submittal of the response action plan as part of the permit application process. One commenter suggested that the response action plan for both leakage rates above the rapid and extremely large leakage rate and leakage rates above the proposed action leakage rate but below the rapid and extremely large leakage rate should be submitted as part of the permit application. Another commenter argued against submittal as part of the permit application. The commenter stated that the bottom liner system can contain leakage rates in excess of the rapid and extremely large leakage rate until the response action plan is approved, and that such liquid would not migrate very far into the bottom liner before the response action plan was approved.

Unlike the proposed rule, the final rule requires owners or operators to submit only one response action plan for leakages exceeding the action leakage rate. Although EPA acknowledges that the bottom liner will provide initial containment of any leakage into the leak detection system, EPA still feels that leakage above the action leakage rate is an indication of a significant problem with the unit. The Agency believes that a response action plan is necessary before receipt of the waste into a unit to assure that there is both a commitment and an instrument in place to initiate responses upon exceedance of the action leakage rate, before leaks can potentially migrate out of the unit.

The final rule requires that new hazardous waste management facilities submit their response action plans and have them approved as part of the permit application process. Permitted facilities must submit the plan as part of a permit modification according to the procedures in § 270.42. Consistent with the minimum technology notification requirements of RCRA section 3015 for surface impoundments and landfills, owners and operators of units at interim status facilities subject to today's leak detection system rules are required to submit a response action plant in conjunction with the proposed action leakage rate 60 days prior to receiving waste into the unit.

D. Monitoring and Inspection Requirements

In today's final rule, EPA is promulgating several minor amendments to monitoring and inspection requirements for new and replacement landfills, surface impoundments, and waste piles, and lateral expansions of these units. These amendments add inspection requirements for leak detection systems (§§ 264.226, 264.254, 264.303, 265.226, 265.260, and 265.304). Specifically, today's rule requires facility owners and operators to monitor the sumps in leak detection systems for the presence of liquids in the sumps and record the amount of liquid removed from the sumps. Under §§ 264.222(b), 264.252(b), 264.302(b), 265.222(c), 265.255(c), and 265.302(c), owners or operators must calculate the average daily flow rate in gpad for each leak detection system sump on a weekly basis during the active life and monthly during the post-closure period, when monthly monitoring is required, to determine if the action leakage rate has been exceeded.

In the May 29, 1987, proposal, EPA proposed to require daily monitoring of the leak detection system sump during the active life of the units, and weekly monitoring during the post-closure period. EPA received several comments on the issue of the frequency of leak detection system sump monitoring requirements. Among those who commented, several objected to the requirement for leak detection system sump measurement on a daily basis during the active life because (1) not all facilities are operational on weekends and holidays, and (2) the payment of overtime rates to personnel for monitoring activities on weekends and holidays would be a significant financial burden. Other commenters stated that it would be difficult to monitor many sumps on a daily basis, especially large sumps or facilities with small leakage rates. One commenter suggested monthly monitoring of the leak detection sump. Most of these commenters suggested that monitoring the sump weekly during the active life was sufficient to determine exceedance of an action leakage rate.

EPA maintains that precipitation or other events may lead to large heads on the bottom liner over a period of a week, and that monthly monitoring of the sump during the active life is insufficient for observing changes in liquid levels in the sump that may necessitate action on the part of the owner or operator. However, EPA agrees with commenters that daily monitoring of the sumps is excessive given that the Agency has redefined the action leakage rate that triggers a response action. Thus, EPA has changed the requirement from daily monitoring of the leak detection system sump to require weekly monitoring during the active life and closure period. As discussed earlier, EPA has also changed the requirement from daily removal of accumulated liquids in the sump to a requirement to remove liquids from the sump as necessary to minimize head on the bottom liner (§§ 264.221(c)(3), 264.251(c)(4), 264.301(c)(4), 265.221(a), 265.254(a), and 265.301(a)).

Two commenters also objected to the requirement to monitor the leak detection system sump weekly during post-closure. These commenters stated that monthly monitoring would be sufficient because the elimination of liquids from incident precipitation and the reduction of drainage from wastes will result in insignificant leachate

generation in the years following closure. These commenters stated that monitoring should be conducted monthly or quarterly and more often only if the volumes of liquid in the sump increased.

EPA acknowledges that leachate generation should decrease in the years following closure of the unit, due to the effectiveness of the final cover. In response to comments received on this issue, EPA is allowing owners or operators to conduct monthly monitoring of the sump after the final cover is installed on the unit (§§ 264.226(d), 264.303(c), 265.226(c), and 265.304(a)). The Agency has also decided in the final rule to allow owners or operators to conduct quarterly monitoring of the sumps during post-closure, if the liquid levels in the sump stay below the pump operating level for two consecutive months, and/or semi-annual monitoring of the sumps if the liquid level in the sump stays below the pump operating level for two consecutive quarterly inspections. However, if pumping is required to remove liquids from the leak detection sump (i.e., liquids above the operating level of the sump) at any time during quarterly or semi-annual inspections, owners or operators must increase their monitoring to a monthly or quarterly basis, respectively. However, the Agency acknowledges that in some cases the levels may vary at facilities depending on the design and geometry of the sump and the type of pump used.

The "pump operating level" is a level proposed by the owner or operator and approved by the Regional Administrator based on sump dimensions, pump activation levels, and a level that avoids backup of liquids (from the sump and drainage tile or pipes) into the drainage layer.

Today's rule requires the owner or operator to monitor for and record the presence and level of liquids present in each leak detection sump, as well as the amount of liquids removed from the sump, to determine the leakage rate through the top liner. The leachate volume in the sump typically will be determined by measuring the liquid level in the sump. The leachate volume removed from the sump can be determined by collecting (in containers, tanks, etc.) and measuring the quantity of liquid pumped out of the sump or, alternatively, by installing flow-metering equipment to record the volumes. A third option is to install a device to measure inflow into the sump, for those units where the sump is located outside the unit; this may be a weir or pump at the sump inflow pipe. The leakage rate is to be calculated as the volume of liquid entering the sump over a period of time divided by the time and then also divided by the unit area served by the sump.

EPA is today requiring, as proposed, that the measured leakage rate in each sump in the leak detection system be used for determining whether the action leakage rate for the unit has been exceeded. EPA received several comments on this requirement. These commenters maintained that a variance from the action leakage rate should be available when it can be demonstrated that liquid in the leak detection system is from a source other than leakage through the top liner. EPA acknowledges that the actual leakage rate through the top liner may be different (larger or smaller) than the measured leakage rate at the sump depending on: (1) The collection efficiency of the system and (2) the presence of water in the leak detection system from construction, ground-water infiltration, consolidation of compacted soil liners, or additional sources of liquid other than leakage. However, owners and operators may consider these other sources of liquid when determining an action leakage rate that is appropriate for their unit and in developing their response action plan.

Today's final rule makes several technical amendments to the general inspection requirements and operating record requirements for units affected by today's rule. EPA today is amending § 264.15 by correcting an earlier oversight by adding requirements to inspect hazardous waste tanks as required by §§ 264.193 and 264.195 (today's amendments also remove two erroneous cross-references—§§ 264.194 and 264.253—from § 264.15). Section 265.15 is being amended by adding today's inspection requirements for units at interim status facilities under §§ 265.260, 265.278, and 265.304. EPA is also today making technical changes to the operating record requirements for units affected by today's rule at permitted and interim status facilities in §§ 264.73 and 265.73. These sections have been modified to reference recordkeeping requirements for permitted tank facilities (in §§ 264.191, 264.193, and 264.195) and interim status tank facilities (in §§ 265.191, 265.193, and 265.195).

E. Construction Quality Assurance

EPA today is promulgating construction quality assurance requirements (CQA) for all new landfills, surface impoundments, and waste piles, and replacements and lateral expansions of such units to the extent they are affected by the double-liner system and leak detection system requirements in today's rule. Today's CQA requirements also apply, to the extent they are relevant to units built under variances granted under §§ 264.221, 264.251, 264.301, 265.221, 265.254, and 265.301. The Agency has concluded that CQA is integral to ensure the proper construction, operation, and design of double-liner and leak detection systems and the closure of land disposal units. The CQA requirements being issued incorporate standard engineering practices and common hazardous waste management industry practices that have already been proven to ensure that the design and performance standards of today's final rule are met.

EPA is today promulgating CQA requirements applicable to foundations, dikes, low-permeability soil liners, geomembranes, leachate collection and removal systems, leak detection systems, and final covers.

The Agency has conducted a number of studies that outline the need for CQA. In 1983, EPA conducted a study assessing existing technology for liner installation at hazardous waste land disposal facilities ("Liner and Leak Detection Rule Background Document", 1987). The data base used in the study consisted of information from the literature supplemented by data collected through 40 interviews with technical experts in industry, State regulatory agencies, trade and professional associations, research organizations, and waste management companies. This study's conclusions were: (1) Construction-related problems during liner system installation constituted one of the major causes of liner system failure and (2) a rigorous CQA program could have identified and corrected many of the problems that contributed to such failure. The study also concluded that construction techniques that were available at that time could be used to install geomembrane and clay liner systems that met the Agency's performance standards for liner systems. However, the study noted that a comprehensive monitoring and audit program during construction would be needed to attain the Agency's performance standards for liner systems.

In 1985, EPA conducted another study to supplement existing information on liner performance ("Liner and Leak Detection Rule Background Document", 1987). This study was designed to evaluate the factors that contributed to successes and failures at 27 landfills and surface impoundments selected for case studies. The results of this study showed

that there were two main elements related to successful liner installation. The first element was a proper conceptual approach applied to all stages of unit construction, use, and closure, including design, material selection, contractor selection, liner system installation, facility operation, and final cover design and installation. The second element was the extensive use of formal CQA programs to ensure that the components of the unit were constructed properly in all stages of a unit's construction. The report stated that a CQA program resulted in a better constructed liner system.

EPA data show the performance of double liner systems and leachate collection and removal/leak detection systems is greatly enhanced when CQA procedures are implemented. The implementation of CQA procedures results in increased leachate collection efficiency and reduces leakage through both synthetic and compacted soil liners. For example, information compiled in a recent report ("Action Leakage Rates for Leak Detection Systems", January, 1992) showed that from a group of landfills with geomembrane only top liners, 8 of 11 landfill cells showed leakage rates below 20 gpad when good CQA was implemented, as opposed to only 1 of 5 landfill cells where CQA was not implemented.

With the improved, consistent, performance of the double liner and leachate collection and removal system come significant environmental and practical benefits. The resultant reduction in leakage rates through the top and bottom liners reduces the threat of migration of hazardous constituents to ground water, as is called for by section 3004(o) of RCRA. The use of CQA also may result in fewer costly repairs to land disposal units after waste has been received, fewer occasions when an action leakage rate is exceeded and implementation of response action plans is necessary, and a diminished long-term need for corrective action.

Today's requirements for CQA add a framework for requirements already established in the regulations for CQA for permitted landfill, surface impoundment, and waste pile construction. Current regulations for these units (§§ 264.226, 264.254, and 264.303) already specify that synthetic and soil liners be inspected for uniformity, damage, and imperfections during and immediately after installation. The CQA requirements being promulgated primarily add procedures to ensure that the existing general performance standards for CQA are met. Because the requirements of today's rule also apply to new units and lateral expansions and replacements of existing units at interim status facilities, today's CQA requirements also apply to these units. The requirements being promulgated in §§ 264.19 and 265.19 are in contrast to those in the May 29, 1987 proposal, which would have put in place a substantial CQA program. EPA has concluded that the proposal was, in fact, redundant with existing guidance manuals and also unduly prescriptive and detailed with respect to methods, approaches, and documentation to the Regional Administrator.

The Agency is today continuing to rely on available Agency guidance documents (instead of additional regulations) to implement the performance standards for construction quality assurance of today's final rule because EPA believes that newer technologies may be discouraged by detailed regulations. Agency guidance includes guidelines for selecting specific test methodologies and the number of tests that should be conducted during installation, both of which will vary significantly for different types of units, construction materials, and unit locations. A final guidance document, entitled "Construction Quality Assurance for Hazardous Waste Land Disposal Facilities" (EPA 530–SW–86–031, October 1986), includes detailed guidance on the components of the CQA requirements of today's final rule. Additional guidance is also available in the May 24, 1985 draft "Minimum Technology Guidance on Double Liner Systems for Landfills and Surface Impoundments—Design, Construction, and Operation." Guidance for the construction of clay liners is available in the November, 1988 document entitled "Design, Construction, and Evaluation of Clay Liners for Waste Management Facilities" (EPA 530–SW–86–007F).

In today's final rule, EPA is requiring a site-specific construction quality assurance plan to be prepared by the owner or operator of new landfills, surface impoundments, and waste piles, and replacements and lateral expansions of such units (§§ 264.19(b) and 265.19(b)). This requirement is the same as was proposed in the May 29, 1987 proposed rule. EPA has concluded that this plan is needed to ensure that a hazardous waste management unit is designed, constructed, operated, and closed in accordance with the CQA program for the unit. Owners or operaters are required to prepare a CQA plan before constructing all new units, replacement units, and lateral expansions of existing units at both permitted and interim status facilities.

The Agency received several comments objecting to two requirements for interim status facilities to submit documentation under the CQA program. These commenters objected to the proposed requirement that the owner or operator submit, prior to construction, a CQA plan describing actions to be taken to implement the CQA program. The commenters also objected to an associated requirement to submit, prior to placing wastes in the unit, a CQA report documenting compliance with the CQA plan. Many of these commenters felt that these approval processes could result in unnecessary delays in construction of new units at interim status facilities. EPA agrees with the commenters and is eliminating the requirement for interim status facilities to submit a CQA plan for approval. EPA is instead requiring that interim status facilities prepare a CQA plan and maintain it onsite. By contrast, permitted facilities must submit a CQA plan as part of the Part B permit application; any changes to an approved plan at a permitted facility would require a permit modification. In addition, the Agency is dropping the requirement for these interim status facilities to submit a CQA report and has replaced this requirement with one to submit a CQA certification (§ 265.19(d)). EPA is, however, reserving the right to request supporting documentation for the certification. This certification will ensure that CQA procedures have been followed at the facility. The certification must be signed by a registered professional engineer serving as a CQA officer, and must state that the unit has been constructed in accordance with the CQA plan and meets the design specifications. For units at permitted facilities, this certification must be submitted by the owner or operator to the Regional Administrator and either approved or have approval waived by the Regional Administrator under § 270.30(l)(2)(ii) prior to the receipt of waste. For units at interim status facilities, the owner or operator must submit this certification at least 30 days prior to the receipt of waste; this will allow the Regional Administrator time to review the certification, and if necessary, request additional information from the owner or operator. The owner or operator may receive wastes in the unit after 30 days, unless (1) the Regional Administrator notifies the owner or operator in writing that the construction is unacceptable, (2) the Regional Administrator extends the review period (by a maximum of 30

days), or (3) the Regional Administrator requests additional information within the 30-day period from submission of the CQA certification. The certification of CQA activities for the final cover is already addressed in the overall certification required for closure activities under parts 264 and 265.

EPA is also specifically requiring the use of a test fill for compacted soil liners as proposed in the May 29, 1987, proposed rule. The test fill is an area developed using the actual materials of construction for the compacted soil component of the bottom composite liner to ensure that the liner is constructed to meet design requirements for field permeability (§§ 264.19(c)(2) and 265.19(c)(2)). The test fill will allow owners and operators, in many cases, to avoid the costs of failures of the full-scale unit by identifying problems during the test fill analysis.

EPA received several comments on the requirement for a test fill. Some commenters argued that a test fill was not necessary, claiming that it is expensive and does not provide any better data than laboratory tests. One commenter contended that field permeability tests may be less precise than laboratory tests, because the field testing is subjected to more uncontrolled variables (e.g., weather conditions) than laboratory tests, and therefore a test fill often cannot be made to precisely replicate the larger unit.

EPA disagrees, and is confident that, when functionally equivalent materials and equipment are used, a test fill can be constructed to provide more accurate indication of full-scale unit performance. Recent data compiled from permit applicants shows that laboratory studies have often not accurately predicted field permeability of the installed liner. The Agency has found that constructed soil liners will often test well in the laboratory because specimen preparation activities (e.g., root removal, visual selection of a uniform sample, additional compaction) have been conducted on the laboratory sample. These preparation activities are often not achieved to the same degree in a large, field-scale operation. EPA has found that test fill testing using large-scale field tests (e.g., sealed double ring infiltrometer) consistently provide a more accurate indicator of the performance of a full scale unit than do laboratory tests. For these reasons, EPA concludes that the information gained from field testing of test fills is a more reliable indicator of actual field conditions than laboratory tests, and so is stipulating the use of field testing for test fills in today's rule. However, to provide flexibility, today's final rule contains a provision allowing for an alternative demonstration where available data are sufficient to clearly show that a constructed soil liner will meet design specifications (e.g., test fill data from a soil liner constructed using functionally equivalent materials and methods of construction). The Agency believes that as more test fills are constructed, this variance will become more achievable because more data will be available. For units at permitted facilities, this variance must be obtained as part of the permitting process; for interim status units, this variance is self-implementing. EPA is, however, reserving the right to review during inspections documentation associated with variances claimed by owners or operators of units at interim status facilities.

F. Implementation of Permitting and Interim Status Requirements

Today's final rule amends the existing part B permit application requirements in §§ 270.17, 270.18 and 270.21 for surface impoundments, waste piles, and landfills at facilities seeking a RCRA permit. These new provisions require owners or operators of such units to provide information on how the liner and leak detection system will be designed, constructed, operated, and maintained to meet the requirements of part 264. Today's rule also requires owners or operators who propose alternative designs for double liner, leachate collection and removal systems, or leak detection systems to submit the appropriate detailed plans, and engineering and hydrogeologic reports describing the alternative designs and operating practices, including pertinent location aspects. In addition, today's rule requires the owner or operator to submit the proposed action leakage rate, the response action plan and the CQA plan for review in the permitting process. Sections 270.17, 270.18, and 270.21 also require owners or operators to provide a description of how the leak detection system will be inspected to meet the requirements in part 264. The unit design, action leakage rate, response action plan, CQA plan, monitoring provisions, and inspection schedule will become permit conditions that must be complied with over the life of the permit. The monitoring and inspection items become part of the inspection schedule under § 264.15(b).

Currently permitted facilities that are affected by today's rule must submit permit modifications to EPA under the procedures of § 270.42. Since the March 28, 1986 and May 29, 1987 proposals, EPA has promulgated amendments to the procedures for permit modifications for treatment, storage, and disposal facilities (53 FR 37912, September 28, 1988). EPA will implement the new double-liner and leak detection system requirements using the new permit modification procedures, consistent with EPA policy (53 FR 37912, September 28, 1988). Therefore, today's rule contains amendments to § 270.42 that categorize the amended part 264 requirements of today's rule as various classes of permit modifications.

Today's rule subjects owners and operators of interim status facilities to the same design and operating requirements as permitted facilities. However, procedural requirements for documentation or reporting have been structured to be more self-implementing for interim status facilities since these facilities have not yet been subjected to the site-specific tailored standards of a permit. In today's rule, owners or operators of interim status facilities that are subject to today's requirements will follow the same notification and approval procedures existing for interim status surface impoundments and landfills subjected to the minimum technological requirements in section 3015 of RCRA (§§ 265.221(b) and 265.301(b)).

Existing regulations require interim status facilities to submit a notice to the Regional Administrator at least 60 days prior to receiving hazardous waste in units affected by today's requirements. In today's rule, EPA is requiring that owners or operators submit their proposed action leakage rate and response action plan to the Regional Administrator at least 60 days prior to receiving hazardous waste in units affected by today's requirements. If no objection or extension of the review time is made by the Regional Administrator, the proposed action leakage rate and response action plan are effective. In addition, EPA is requiring owners or operators to submit a certification that the unit has been constructed in accordance with the CQA plan at least 30 days prior to receiving hazardous waste in units affected by today's standards. If no objection or extension to the review time is made by the Regional Administrator by the end of the 30-day period, the owner or operator may receive wastes in the unit.

Interim status facilities are required to prepare, but are not required to submit, their design and operating plans, monitoring plans, or CQA plans prior to receiving wastes. These documents must be retained on-site and be available for review by the Regional Administrator. EPA is not requiring submission and

advance approval of this information because such activities would be inconsistent with the goal of interim status to minimize review and approval by the Regional Administrator.

V. State Authority

A. Applicability of Rule in Authorized States

Under section 3006 of RCRA, EPA may authorize qualified States to administer and enforce the RCRA program within the State. Following authorization, EPA retains enforcement authority under section 3008, 3013, and 7003 of RCRA, although authorized States have primary enforcement responsibility. The standards and requirements for authorization are found in 40 CFR part 271.

Prior to the Hazardous Solid Waste Amendments of 1984 (HSWA), a State with final authorization administered its hazardous waste program in lieu of EPA's administering the Federal program in that State. The Federal requirements no longer applied in the authorized State, and EPA could not issue permits for any facilities that the State was authorized to permit. When new, more stringent Federal requirements were promulgated or enacted, the State was obliged to enact equivalent authority within specified time frames. New Federal requirements did not take effect in an authorized State until the State adopted the requirements as State law and was authorized for the requirements.

In contrast, under RCRA section 3006(g), new requirements and prohibitions imposed by HSWA take effect in authorized States at the same time that they take effect in non-authorized States. EPA is directed to carry out these requirements and prohibitions in authorized States, including the issuance of permits, until the State is granted authorization to do so. While States must still adopt HSWA-related provisions as State law to retain final authorization, HSWA-based requirements apply in authorized States in the interim.

B. Effect on State Authorizations

Most of today's final rule for liners and leak detection systems is finalized pursuant to RCRA sections 3004(o) and 3015 which were added by HSWA. The HSWA-based requirements are being added to Table 1 in 40 CFR 271.1(j), which identifies the Federal program requirements that are promulgated pursuant to HSWA and take effect in all States, regardless of their authorization status. As noted above, EPA will implement those HSWA-based sections of today's rule in authorized States until their programs are modified to adopt these rules and the modification is approved by EPA. Because these requirements are finalized pursuant to HSWA, a State submitting a program modification may apply to receive either interim or final authorization under RCRA section 3006(g)(2) or 3006(b), respectively, on the basis of state requirements that are equivalent or substantially equivalent to EPA's. The procedures and schedule for State program modifications for either interim or final authorization are described in 40 CFR 271.21. The deadline by which the States must modify their programs to adopt today's rule is July 1, 1993. It should be noted that HSWA interim authorization will expire on January 1, 1993 (see 40 CFR 271.24(c)).

Portions of today's rule at the time they were proposed on May 29, 1987 (52 FR 20220), were proposed to be adopted pursuant to RCRA. As non-HSWA rules, therefore, they would not be effective in authorized States until those States revised their programs to adopt equivalent requirements under State law. EPA has reconsidered this issue and now interprets the statute to allow more of the rule, including the CQA, with the exception of its application to final cover requirements, to be promulgated pursuant to HSWA.

EPA views today's CQA requirements to be vital for liner and leak detection systems to perform as intended by HSWA, in section 3004(o), by effectively preventing the migration of hazardous constituents into and through liners and for detecting leaks of hazardous constituents at the earliest practicable time. The Agency has determined that CQA at land disposal facilities improves the performance of liners and leak detection systems. Specifically, test fills have proven to be necessary for ensuring that compacted soil liners satisfy the permeability requirements set by the statute. The response action plans, based on detected leakage from land disposal units are also considered to be integral parts of the process established by section 3004(o) for early detection of liner breakthrough and prevention of migration of hazardous constituents into the ground and surface water. Consequently, the Agency views the CQA program and the response action plan (including the action leakage rate and monitoring to determine if the flow rate exceeds the action leakage rate) to be promulgated pursuant to HSWA for those units where the liner and leak detection standards are promulgated pursuant to HSWA

New and replacement surface impoundments and landfill units, and lateral expansions of such units at facilities for which a permit application was received before November 8, 1984, are not explicitly addressed by section 3004(o)(1)(A); however, these units are covered by existing liner requirements which today are being revised by the Agency to take into account improvements in control technology. Thus these revisions are HSWA rules pursuant to section 3004(o)(1). Although section 3004(o)(1)(A) does not require waste piles to meet the double liner and leachate collection system standards, existing regulations already contain liner standards for waste piles and, therefore, pursuant to section 3004(o)(1), the Agency is revising the existing waste pile regulations to take into account improvements in control technology. As a result, the Agency is also promulgating these double liner and leachate collection system standards for waste piles as HSWA requirements In addition, the Agency views the liner requirements for new waste piles as mandated by the form of leak detection chosen for these regulations; and therefore the liners standards from this point of view are also HSWA requirements. Leak detection for replacement units and lateral expansions of existing units (landfills, surface impoundments, and waste piles) at permitted facilities and at interim status waste piles are also being issued as improvements in control and measurement technologies under section 3004(o)(1) of RCRA.

CQA requirements for final covers at both permitted and interim status facilities are promulgated pursuant to section 3004(a) of RCRA, since final covers is not a HSWA requirement. The CQA requirements for final covers, therefore, will not be effective in authorized states. They will be applicable only in those states that do not have authorization. In authorized states, the CQA requirements for final covers at permitted and interim status facilities will not be effective until the state revises its program to adopt equivalent requirements under state law and receives authorization by EPA for them.

Section 40 CFR 271.21(e)(2) requires States that have final authorization to modify their programs to reflect Federal program changes and to submit the modification to EPA for approval. The deadline by which the State must modify its program to adopt this regulation is determined by the promulgation date in accordance with 40 CFR 271.21(e). These deadlines can be extended in certain cases (40 CFR 271.21(e)(3)). Once EPA approves the

modification, the State requirements become subtitle C RCRA requirements.

Authorized States are only required to modify their programs when EPA promulgates Federal regulations that are more stringent or broader in scope than the existing Federal regulations. For those Federal program changes that are less stringent or reduce the scope of the Federal program, States are not required to modify their programs. This is a result of section 3009 of RCRA, which allows States to impose regulations in addition to those in the Federal program. EPA has determined that the liner and leak detection systems rule is more stringent than the existing Federal regulations. Therefore, authorized States are required to modify their programs to adopt regulations that are equivalent or substantially equivalent.

States with authorized RCRA programs may already have requirements similar to those in today's rule. These State regulations have not been assessed against the Federal regulations being finalized today to determine whether they meet the tests for authorization. Thus, a State is not authorized to implement these requirements in lieu of EPA until the State program modification is approved. Of course, States with existing standards may continue to administer and enforce their standards as a matter of State law. In implementing the Federal program, EPA will work with States under agreements to minimize duplication of efforts. In many cases, EPA will be able to defer to the States in their efforts to implement their programs rather than take separate actions under Federal authority.

States that submit official applications for final authorization less than 12 months after the effective date of these regulations are not required to include standards equivalent to these regulations in their application. States that submit official applications for final authorization 12 months after the effective date of these regulations must include standards equivalent to these regulations in their application. The requirements a State must meet when submitting its final authorization application are set forth in 40 CFR 271.3.

VI. Regulatory Requirements

A. Economic Impact Analysis

Executive Order No. 12291 requires that regulatory agencies determine whether a new regulation constitutes a major rulemaking and, if so, it requires that the agency conduct a Regulatory Impact Analysis (RIA). An RIA consists of the quantification of the potential benefits, costs, and economic impacts of a major rule. A major rule is defined in Executive Order No. 12291 as a regulation likely to result in:

- An annual effect on the economy of $100 million or more; or
- A major increase in costs or prices for consumers, individuals, industries, Federal, State, and local government agencies, or geographic regions; or
- Significant adverse effects on competition, employment, investment, productivity, innovation, or on the ability of United States based enterprises to compete with foreign based enterprises in domestic or export markets.

EPA estimated the effects of this rule to determine if it is a major regulation as defined by Executive Order. The Agency's results indicate that the rule has an annual cost below $100 million. Furthermore, the Agency does not believe the rule will significantly increase costs for consumers, individuals, industries, Federal, State and local government agencies, or geographic regions, or have significant adverse effects on competition employment, investment, innovation, or international trade. Therefore, the Agency determines that the rule is not a major rule.

Because the rule is not a major rule, EPA has performed an Economic Impact Analysis (EIA), focusing its analyses on the costs and economic impacts of the rule only. The Agency's cost analysis indicates the annual incremental costs of the rule will be approximately $23 million per year (all costs are in 1990 dollars).

1. Estimated Cost of the Rule

a. *General approach.* EPA estimated incremental costs for provisions of the final rule which require new compliance activities. The incremental cost of each provision was estimated by computing the difference between the cost of complying with the provision and the cost of complying with current regulations (the baseline for measurement). The baseline created by current regulations includes requirements imposed on hazardous waste landfills, surface impoundments, and waste piles by the July 26, 1982 permitting requirements for land disposal facilities (47 FR 32274) and the July 15, 1985 Hazardous Waste Management System Final Codification Rule (50 FR 28702). These rules, taken together, create baseline landfills having synthetic membrane top liners over a clay bottom liner with leachate collection systems between the liners and on top of the membrane liner. Baseline surface impoundments are constructed similarly, but lack the leachate collection system over the top liner. Baseline waste piles are assumed to be built with a single clay liner beneath a leachate collection system.

In projecting the costs of today's provisions EPA developed estimates of affected populations, unit costs of compliance, and aggregate costs of compliance. Estimates of affected populations were based on the permitted land disposal universe as reported in the EPA Hazardous Waste Data Management System (HWDMS) and RCRIS National Oversight Data Base (October, 1991). Use of the permitted universe was based on the fact that by November 8, 1988, the Agency was required to permit all land disposal facilities that had submitted permit applications by November 8, 1984 (HSWA section 3005(c)(2)). This mandate has resulted in the permitting of nearly all of the land disposal universe. The data base does not, however, identify a very small future population that may be affected by the regulations being promulgated today (i.e., newly-regulated interim status facilities brought into the land disposal universe via new rulemakings). These new interim status facilities, however, are expected to be offset by facilities dropping out of the RCRA Subtitle C land disposal universe as a result of regulatory programs.

Unit costs of compliance, based on capital costs and operating and maintenance costs were developed using EPA's Liner Location and Cost Analysis Model. Both direct and indirect costs were included. Aggregate costs were then obtained by multiplying unit costs by the number of units in the affected population.

In the final rule, costs from the 1987 proposal have been adjusted for inflation and are expressed in terms of 1990 dollars. Also, cost estimates from the 1987 proposal have been adjusted to account for differences between the proposal and the final rule. Therefore, all costs related to permitted land treatment units have been removed. Costs associated with the implementation of response action plans have been incorporated in the final rule, although EPA expects that few facilities will exceed the action leakage rate which triggers response action. In addition, leak detection system unit costs for surface impoundments have been adjusted upward to account for the higher costs of higher-permeability (1×10^{-1} cm/sec) drainage material (this cost was not included in the cost analysis for the May 29, 1987 proposed rule). The CQA costs developed for the 1987 proposal have been incorporated in this final rule analysis with a few

modifications. First, costs used to calculate certain CQA activities for test fills were adjusted upward to reflect new cost information (See Section c. below). Second, an incremental cost of $400 per unit has been added to cover the cost of a professional engineer certifying that each unit was constructed according to the CQA plan. Finally, CQA costs related to closure have been deleted from the analysis. EPA believes owners and operators are routinely performing closure activities when complying with existing rules, which require certification of closure by a registered, professional engineer. Consequently, we do not believe these CQA requirements represent incremental costs attributable to this rulemaking.

EPA used discounted cash flow analysis to convert streams of costs over time to equivalent annual costs over the life of the facility. First, EPA converted cost streams to present values as follows:

$$PV = \sum_{i=0}^{n} \frac{(costs)}{(1+r)^n} \quad n$$

where the real rate of return (r) equals 3 percent and n is the number of periods in which costs are incurred. The cash flows do not include inflation, taxes, or depreciation. As such, the present value costs report the full pre-tax compliance costs in real terms assuming that an owner or operator can access capital at a real interest rate of 3 percent.

Second, in order to spread the costs evenly over the life of the facility, EPA annualized the present value costs by multiplying them by a capital recovery factor (CRF):

$$CRF = \frac{r(r+1)^{OL}}{(r+1)^{OL}-1}$$

where OL is the operating life of the facility. EPA assumed a 20-year operating life and a 3 percent real rate of return, which leads to a CRF of 0.0672. The annualized value represents the annual revenue required to cover the costs imposed by the provision. This value provides a consistent basis for presenting and comparing costs of different provisions. However, it implicitly assumes that facilities can predict future costs and access capital at a steady rate over the life of the facility.

b. *Double liner and leak detection system.* The final rule extends the requirements for double liners to waste piles. The rule also requires the bottom liners of landfills, surface impoundments, and waste piles to be a composite liner and a leak detection system to be installed above the bottom composite liner. The owner or operator is also required to propose an action leakage rate to serve as a trigger for response action and prepare a response action plan that would describe responses to be initiated by the owner or operator when leakage through the top liner exceeded the action leakage rate.

(1) Landfill cost analysis. In estimating the cost of complying with the composite bottom-liner and leak detection system provisions, EPA assumed that the number of landfills would remain equal to the current number in the affected population and that each unit would have a 20-year operating life and a 30-year post-closure care period. This simplifying assumption was necessary due to lack of data on the current and future number of new landfill units, replacement units, and lateral expansions. EPA also assumed that one cell would be opened and closed each year during the 20-year operating life of a unit. EPA also assumed that landfill owners or operators currently use double liners (but only a clay bottom liner) with leachate collection systems above and between the liners as required by the interim statutory design requirements, codified in §§ 264.301 and 265.301.

Based on facilities listed in the HWDMS and RCRIS National Oversight Data Base, the affected population was found to include 74 landfill facilities each with at least one unit, ranging in size from 500 MT/year to 150,000 MT/year. The affected population and the total incremental costs (above current statutory requirements) of the leak detection system provisions are shown in Table 1. This figure includes an annual allowance for repair costs similar to an insurance premium based on an assumption that 5 percent of units of all types and sizes will experience a leak at some time during their 20-year life large enough to require implementation of the response action plan. We believe the 5 percent rate is a reasonable upper limit for properly constructed units, based on an analysis of flow rates in leak detection systems at 82 landfill and surface impoundment units. Unit repair costs range from $28,000 for a 500 MT/year landfill to $6,100,000 for a 150,000 MT/year landfill (1990 dollars). EPA estimates that the incremental annualized costs for landfills required to comply with the liner and leak detection system provisions would be approximately $4,850,000.

TABLE 1.—COST OF COMPLIANCE WITH DOUBLE LINER AND LEAK DETECTIONS SYSTEM PROVISIONS FOR LANDFILL UNITS

[1990 Dollars]

Size	Number of active units	Incremental annualized present value unit cost ($1,000)	Incremental annualized present value total cost [1] ($1,000)	Allowance for repairs—Annualized present value total costs for all units [1] ($1,000)	Total costs per metric ton per year ($1,000)
500 mt/yr	28	11.1	310.5	39.2	78
1,000 mt/yr	8	14.6	116.5	22.4	17
2,000 mt/yr	5	19.9	99.7	28.0	13
6,000 mt/yr	12	37.2	446.2	168.0	8
15,000 mt/yr	13	55.4	720.8	436.7	5
35,000 mt/yr	4	98.0	392.0	302.4	5
60,000 mt/yr	1	134.7	134.7	126.0	4
100,000 mt/yr	1	194.3	194.3	207.2	4
150,000 mt/yr	2	247.7	495.3	610.3	8
Subtotal	74		2910.1	1940.1	
Total				4850.2	

[1] Totals may not compute exactly due to roundoff.

(2) Surface Impoundment Cost Analysis. To estimate the cost of the complete bottom-liner and leak detection system provisions, EPA assumed that the number of surface impoundment units would remain equal to the current number in the affected population (except that no new impoundments larger than 15 acres would be constructed) and that each unit would have a 20-year operating life. EPA also assumed that double liners (but only clay bottom liners) with a leachate collection system in between as required by the interim statutory design requirements, codified in §§ 264.221 and 265.221 are currently being used. We assumed that leachate collection drainage media having a permeability of 10^{-2} cm/sec are currently being used. Based on facilities identified in the data base, we estimated the affected population to include 329 surface impoundment units at 143 facilities. The units range in size from 0.25 acres to 15 acres. The affected population and the total incremental annualized costs (above current statutory requirements) of compliance with the leak detection system provisions are shown in Table 2. As with landfills, these costs include an allowance for repair costs based on an assumption that 5 percent will require repair during their 20-year life. Unit repair costs range from $28,000 for a 0.25-acre surface impoundment to $1,680,000 for a 15-acre unit (1990 dollars). EPA estimates that the incremental annualized costs of complying with the composite bottom-liner and leak detection system provisions would be approximately $2,650,000.

TABLE 2.—COST OF COMPLIANCE WITH DOUBLE LINER AND LEAK DETECTION SYSTEM PROVISIONS FOR SURFACE IMPOUNDMENT UNITS

[1990 Dollars]

Size	Number of active units [1]	Incremental annualized present value unit cost ($1,000)	Incremental annualized present value total cost [2] ($1,000)	Allowance for repairs—annualized present value total costs for all units ($1,000)[2]
0.25 AC	133	4.4	582.8	9.3
0.50 AC	81	5.2	422.7	11.3
1.00 AC	44	7.2	314.8	12.3
2.00 AC	46	10.8	494.8	25.8
5.00 AC	18	22.0	395.3	25.2
15.00 AC	7	47.0	329.1	29.4
Subtotal	329		2539.5	113.3
Total				2652.8

[1] Based on 2.3 impoundments per active facility.
[2] Totals may not compute exactly due to roundoff.

(3) Waste Pile Cost Analysis. EPA assumed that new, replacement, or expanded waste piles would have to add two geomembrane liners with a leak detection system in between. Current waste pile regulations require only a clay liner with a leachate collection system above. In estimating the cost of compliance with the double liner and leak detection system provisions, EPA assumed that the number of waste pile units would remain the same as the current number and that each unit would have an operating life of 20 years. Based on facilities identified in the data base, the affected population was found to include 35 waste pile facilities ranging in size from 250 cubic feet to 1,000,000 cubic feet.

The affected population and the total incremental costs (above current statutory requirements) of compliance with the double liner and leak detection system provisions are shown in Table 3. As with landfills and surface impoundments, this figure includes an allowance for repair costs based on an assumption that a maximum of 5 percent will require repair during their life. Unit repair costs range from $5,600 for a 250-cubic-foot waste pile to $450,000 for a 1 million-cubic-foot waste pile (1990 dollars). EPA estimates that the incremental annualized costs of compliance with the double liner and leak detection system requirements would be approximately $428,000.

TABLE 3.—COST OF COMPLIANCE WITH DOUBLE LINER AND LEAK DETECTION SYSTEM PROVISIONS FOR SURFACE WASTE PILE UNITS

[1990 Dollars]

Size	Number of active units [1]	Incremental annualized present value unit cost ($1,000)	Incremental annualized present value total cost [2] ($1,000)	Allowance for repairs—annualized present value total costs for all units ($1,000)[2]
250 cu. ft	3	5.2	15.5	<0.1
1,000 cu. ft	7	5.5	38.4	0.2
5,000 cu. ft	7	6.5	45.5	0.3
25,000 cu. ft	6	8.6	51.7	0.5
100,000 cu. ft	5	12.9	64.4	1.0
500,000 cu. ft	3	24.4	73.3	2.1
1,000,000 cu. ft	3	43.8	131.4	3.4
Subtotal	74		420.1	7.5
Total				427.6

[1] Outdoor (uncovered) waste piles.
[2] Total may not compute exactly due to roundoff error.

c. CQA. The final rule would require the owner/operator to complete a CQA plan, implement the plan during construction, and have a professional engineer certify that construction was completed in accordance with the CQA plan. As noted above, costs estimated for the 1987 proposal were used in this analysis except additional costs were added for test fills and certification of a professional engineer, and specific costs associated with closure were not included.

The proposed rule estimated that test fill costs would add about $10,000 (in 1987 dollars) to the cost of each facility. EPA has since determined that this figure is low and we have adjusted test fill costs upward to $50,000 (in 1990 dollars) for all types of units. Tables 4, 5, and 6 depict costs for implementing CQA (including test fills and construction certification) for landfills, surface impoundments, and waste piles, respectively.

d. Total Incremental Costs of the Leak Detection System, CQA, and Double-Liner Requirements. The total costs of the leak detection system, CQA, and double liner provisions are shown in Table 7 for landfills, surface impoundments, and waste piles. The total incremental annualized cost of the provisions would be approximately $7,930,000 for the leak detection system and double liner requirements and $13,400,000 for CQA, for a total of approximately $21,300,000. Table 8 compares the incremental costs from this rulemaking with costs from the July 15, 1985 codification rule and the July 26, 1982 permitting rule.

TABLE 4.—COST OF COMPLIANCE WITH CONSTRUCTION QUALITY ASSURANCE PROVISIONS FOR LANDFILL UNITS

[1990 Dollars]

Size	Number of active units	Incremental annualized present value unit cost ($1,000)	Incremental annualized present value total cost [1] ($1,000)	Total costs per metric ton per year ($1,000)
500 mt/yr	28	114.1	3195.7	230
1,000 mt/yr	8	114.1	913.1	114
2,000 mt/yr	5	114.1	570.7	57
6,000 mt/yr	12	114.1	1369.6	19
15,000 mt/yr	13	152.2	1979.2	8
35,000 mt/yr	4	154.7	618.9	4
60,000 mt/yr	1	209.9	209.9	3
100,000 mt/yr	1	209.9	209.9	2
150,000 mt/yr	2	209.9	419.8	1
Total	74		9466.6	

[1] Totals may not compute exactly due to roundoff.

TABLE 5.—COST OF COMPLIANCE WITH CONSTRUCTION QUALITY ASSURANCE PROVISIONS FOR SURFACE IMPOUNDMENT UNITS

[1990 Dollars]

Size	Number of active units [1]	Incremental annualized present value unit cost ($1,000)	Incremental annualized present value total cost [2] ($1,000)
0.25 AC	58	23.8	1377.7
0.50 AC	35	23.8	831.4
1.00 AC	19	23.8	451.3
2.00 AC	20	23.8	475.1
5.00 AC	8	29.4	235.6
15.00 AC	3	43.5	130.6
Total	143		3501.6

[1] Based on 2.3 impoundments per active facility.
[2] Totals may not compute exactly due to roundoff.

TABLE 6.—COST OF COMPLIANCE WITH CONSTRUCTION QUALITY ASSURANCE PROVISIONS FOR WASTE PILE UNITS

[1990 Dollars]

Size	Number of active units [1]	Incremental annualized present value unit cost ($1,000)	Incremental annualized present value total cost [2] ($1,000)
250 cu. ft	3	11.9	35.8
1,000 cu. ft	7	11.9	83.5
5,000 cu. ft	7	11.9	83.5
25,000 cu. ft	6	11.9	71.6
100,000 cu. ft	5	11.9	59.6
500,000 cu. ft	3	11.9	35.8
1,000,000 cu. ft	3	11.9	35.8
Total	34		405.5

[1] Outdoor (uncovered) waste piles.
[2] Totals may not compute exactly due to roundoff.

TABLE 7.—TOTAL COST OF COMPLIANCE WITH DOUBLE LINER, LEAK DETECTION SYSTEM, AND CQA PROVISIONS

[Incremental Annualized Present Value Cost in 1990 Dollars]

Facility type	Liner/leak detection system ($1,000)	Construction quality assurance ($1,000)	Total ($1,000)
Landfill	4850.2	9486.6	14336.8
Surface Impoundment	2652.8	3501.6	6154.5
Waste Pile	427.6	405.5	833.1
Total	7930.6	13393.7	21324.3

[1] Totals may not compute exactly due to roundoff.

TABLE 8.—INCREMENTAL COSTS OF DESIGN REQUIREMENTS

[In Millions of 1990 Dollars]

Facility type	1982 liner/LCS requirements [1,3]	1985 Double-liner requirements [2,3]	Today's rule [4]
Landfill	13.8–27.0	4.5	14.3
Surface Impoundment	10.4–40.9	11.9	6.2
Waste Pile	0.5–0.9		0.8
Total	24.7–68.8	16.4	21.3

[1] 47 FR 32274.
[2] 50 FR 28702.
[3] Incremental costs above previous Agency rules; costs adjusted to account for current number of units and 1990 dollars.
[4] Incremental costs above previous Agency rules. Costs do not consider potential savings due to use of 1% versus 2% minimum slope.

B. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) of 1980 (Pub. L. 96–354) 5 U.S.C. 601 *et seq.*, which amends the Administrative Procedure Act, requires Federal regulatory agencies to consider small entities throughout the regulatory process. The purposes of the RFA are to describe the effects the regulations will have on small entities and to examine alternatives that may reduce these effects. As indicated at proposal, EPA has determined that today's rule will not have a significant impact on a substantial number of small entities. EPA conducted an evaluation of the impacts of this rule on small businesses. For purposes of this analysis, EPA used Small Business Administration criteria for identifying small businesses and evaluated the impact of today's rule using regulation-induced business closures as the key indicator of regulatory impact. The test assumed that any cost greater than 3 percent of total assets per year will result in forced closures. EPA also considered a second impact measure that compares increased annual compliance costs to total production costs with 5 percent of the threshold for significance. Using these tests, EPA has determined that the regulatory costs of today's rule will not have a significant impact on a substantial number of small entities.

C. Paperwork Reduction Act

The information collection requirements in this rule have been submitted for approval to the Office of Management and Budget (OMB) under the Paperwork Reduction Act, 44 U.S.C. 3501 *et seq.*, and assigned OMB control number ICR No. 995.06 as amended. These requirements are not effective until OMB approves them and a technical amendment to that effect is published in the **Federal Register**. An Information Collection Request document has been prepared by EPA (ICR No. 995.06) and a copy may be obtained from Sandy Farmer, Information Policy Branch, EPA, 401 M Street, SW. (PM–223Y), Washington, DC 20460 or by calling (202) 260–2740.

The public reporting burden for this collection of information is estimated to average 248 hours per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the required data, and completing and reviewing the collection of information.

Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Chief, Information Policy Branch, PM–223Y, U.S. Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460; and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503, marked "Attention: Jonathan Gledhill."

VII. Supporting Documents

The following documents have been prepared in support of this rulemaking and placed in docket number F–92 LLDF–FFFFF.

1. U.S. EPA, "Liner and Leak Detection Rule Background Document", EPA/530–SW–87–015, May, 1987.
2. U.S. EPA, "Bottom Liner Performance in Double-Lined Landfills and Surface Impoundments Background Document", EPA/530–SW–87–013, April, 1987.
3. U.S. EPA, "Compilation of Current Practices at Land Disposal Facilities", January, 1992.
4. U.S. EPA, "Action Leakage Rate for Leak Detection Systems", January, 1992.
5. U.S. EPA, "Response to Public Comments on Final Double-Liner and Leak Detection Rule", January, 1992.
6. U.S. EPA Memorandum, "Revisions to Cost Analysis for the Final Rulemaking Entitled *Liners and Leak Detection Systems for Hazardous Waste Land Disposal Units,*" January, 1992.

List of Subjects in 40 CFR Parts 260, 264, 265, 270, and 271

Administrative practice and procedure, Confidential business information, Hazardous materials transportation, Hazardous waste, Indian lands, Intergovernmental relations, Penalties, Insurance, Packaging and containers, Reporting and recordkeeping requirements, Security measures. Surety

bonds, Water pollution control, Water supply.

Dated: January 15, 1992.

William K. Reilly,

Administrator.

For the reasons set out in the preamble, chapter I of title 40 of the Code of Federal Regulations is amended as follows:

PART 260—HAZARDOUS WASTE MANAGEMENT SYSTEM: GENERAL

1. The authority citation for part 260 continues to read as follows:

Authority: 42 U.S.C. 6905, 6912(a), 6921–6927, 6930, 6934, 6935, 6937, 6938, 6939, and 6974.

2. Section 260.10 is amended by adding the definition of "replacement unit" in alphabetical order, and revising the definition of "sump" to read as follows:

§ 260.10 Definitions.

* * * * *

Replacement unit means a landfill, surface impoundment, or waste pile unit (1) from which all or substantially all of the waste is removed, and (2) that is subsequently reused to treat, store, or dispose of hazardous waste. "Replacement unit" does not apply to a unit from which waste is removed during closure, if the subsequent reuse solely involves the disposal of waste from that unit and other closing units or corrective action areas at the facility, in accordance with an approved closure plan or EPA or State approved corrective action.

* * * * *

Sump means any pit or reservoir that meets the definition of tank and those troughs/trenches connected to it that serve to collect hazardous waste for transport to hazardous waste storage, treatment, or disposal facilities; except that as used in the landfill, surface impoundment, and waste pile rules, "sump" means any lined pit or reservoir that serves to collect liquids drained from a leachate collection and removal system or leak detection system for subsequent removal from the system.

* * * * *

PART 264—STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

1. The authority citation for part 264 continues to read as follows:

Authority: 42 U.S.C. 6905, 6912(a), 6924, and 6925.

2. Section 264.15 is amended by revising paragraph (b)(4) to read as follows:

§ 264.15 General inspection requirements.

* * * * *

(b) * * *

(4) The frequency of inspection may vary for the items on the schedule. However, it should be based on the rate of deterioration of the equipment and the probability of an environmental or human health incident if the deterioration, malfunction, or any operator error goes undetected between inspections. Areas subject to spills, such as loading and unloading areas, must be inspected daily when in use. At a minimum, the inspection schedule must include the items and frequencies called for in §§ 264.174, 264.193, 264.195, 264.226, 264.254, 264.278, 264.303, 264.347, 264.602, 264.1033, 264.1052, 264.1053, and 264.1058, where applicable.

* * * * *

3. Subpart B is amended by adding § 264.19 as follows:

§ 264.19 Construction quality assurance program.

(a) *COA program.* (1) A construction quality assurance (CQA) program is required for all surface impoundment, waste pile, and landfill units that are required to comply with §§ 264.221 (c) and (d), 264.251 (c) and (d), and 264.301 (c) and (d). The program must ensure that the constructed unit meets or exceeds all design criteria and specifications in the permit. The program must be developed and implemented under the direction of a CQA officer who is a registered professional engineer.

(2) The CQA program must address the following physical components, where applicable:

(i) Foundations;

(ii) Dikes;

(iii) Low-permeability soil liners;

(iv) Geomembranes (flexible membrane liners);

(v) Leachate collection and removal systems and leak detection systems; and

(vi) Final cover systems.

(b) *Written CQA plan.* The owner or operator of units subject to the CQA program under paragraph (a) of this section must develop and implement a written CQA plan. The plan must identify steps that will be used to monitor and document the quality of materials and the condition and manner of their installation. The CQA plan must include:

(1) Identification of applicable units, and a description of how they will be constructed.

(2) Identification of key personnel in the development and implementation of the CQA plan, and CQA officer qualifications.

(3) A description of inspection and sampling activities for all unit components identified in paragraph (a)(2) of this section, including observations and tests that will be used before, during, and after construction to ensure that the construction materials and the installed unit components meet the design specifications. The description must cover: Sampling size and locations; frequency of testing; data evaluation procedures; acceptance and rejection criteria for construction materials; plans for implementing corrective measures; and data or other information to be recorded and retained in the operating record under § 264.73.

(c) *Contents of program.* (1) The CQA program must include observations, inspections, tests, and measurements sufficient to ensure:

(i) Structural stability and integrity of all components of the unit identified in paragraph (a)(2) of this section;

(ii) Proper construction of all components of the liners, leachate collection and removal system, leak detection system, and final cover system, according to permit specifications and good engineering practices, and proper installation of all components (e.g., pipes) according to design specifications;

(iii) Conformity of all materials used with design and other material specifications under §§ 264.221, 264.251, and 264.301.

(2) The CQA program shall include test fills for compacted soil liners, using the same compaction methods as in the full scale unit, to ensure that the liners are constructed to meet the hydraulic conductivity requirements of §§ 264.221(c)(1)(i)(B), 264.251(c)(1)(i)(B), and 264.301(c)(1)(i)(B) in the field. Compliance with the hydraulic conductivity requirements must be verified by using in-situ testing on the constructed test fill. The Regional Administrator may accept an alternative demonstration, in lieu of a test fill, where data are sufficient to show that a constructed soil liner will meet the hydraulic conductivity requirements of §§ 264.221(c)(1)(i)(B), 264.251(c)(1)(i)(B), and 264.301(c)(1)(i)(B) in the field.

(d) *Certification.* Waste shall not be received in a unit subject to § 264.19 until the owner or operator has submitted to the Regional Administrator by certified mail or hand delivery a certification signed by the CQA officer that the approved CQA plan has been successfully carried out and that the unit

meets the requirements of §§ 264.221 (c) or (d), 264.251 (c) or (d), or 264.301 (c) or (d); and the procedure in § 270.30(l)(2)(ii) of this chapter has been completed. Documentation supporting the CQA officer's certification must be furnished to the Regional Administrator upon request.

4. Section 264.73 is amended by revising paragraph (b)(6) to read as follows:

§ 264.73 Operating record.

* * * * *

(b) * * *

(6) Monitoring, testing or analytical data, and corrective action where required by subpart F and §§ 264.19, 264.191, 264.193, 264.195, 264.222, 264.223, 264.226, 264.252–264.254, 264.276, 264.278, 264.280, 264.302–264.304, 264.309, 264.347, 264.602, 264.1034(c)–264.1034(f), 264.1035, 264.1063(d)–264.1063(i), and 264.1064.

* * * * *

5. Section 264.221 is amended by redesignating paragraphs (f), (g), and (h) as paragraphs (g), (h), and (i), respectively; by revising paragraphs (c) and (d); and by adding new paragraph (f) to read as follows:

§ 264.221 Design and operating requirements.

* * * * * *

(c) The owner or operator of each new surface impoundment unit on which construction commences after January 29, 1992, each lateral expansion of a surface impoundment unit on which construction commences after July 29, 1992 and each replacement of an existing surface impoundment unit that is to commence reuse after July 29, 1992 must install two or more liners and a leachate collection and removal system between such liners. "Construction commences" is as defined in § 260.10 of this chapter under "existing facility".

(1)(i) The *liner system* must include:

(A) A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into such liner during the active life and post-closure care period; and

(B) A composite bottom liner, consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component during the active life and post-closure care period. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least 3 feet (91 cm) of compacted soil material with a hydraulic conductivity of no more than 1×10^{-7} cm/sec.

(ii) The liners must comply with paragraphs (a) (1), (2), and (3) of this section.

(2) The *leachate collection and removal system* between the liners, and immediately above the bottom composite liner in the case of multiple leachate collection and removal systems, is also a *leak detection system*. This leak detection system must be capable of detecting, collecting, and removing leaks of hazardous constituents at the earliest practicable time through all areas of the top liner likely to be exposed to waste or leachate during the active life and post-closure care period. The requirements for a leak detection system in this paragraph are satisfied by installation of a system that is, at a minimum:

(i) Constructed with a bottom slope of one percent or more;

(ii) Constructed of granular drainage materials with a hydraulic conductivity of 1×10^{-1} cm/sec or more and a thickness of 12 inches (30.5 cm) or more; or constructed of synthetic or geonet drainage materials with a transmissivity of 3×10^{-4} m^2sec or more;

(iii) Constructed of materials that are chemically resistant to the waste managed in the surface impoundment and the leachate expected to be generated, and of sufficient strength and thickness to prevent collapse under the pressures exerted by overlying wastes and any waste cover materials or equipment used at the surface impoundment;

(iv) Designed and operated to minimize clogging during the active life and post-closure care period; and

(v) Constructed with sumps and liquid removal methods (e.g., pumps) of sufficient size to collect and remove liquids from the sump and prevent liquids from backing up into the drainage layer. Each unit must have its own sump(s). The design of each sump and removal system must provide a method for measuring and recording the volume of liquids present in the sump and of liquids removed.

(3) The owner or operator shall collect and remove pumpable liquids in the sumps to minimize the head on the bottom liner.

(4) The owner or operator of a leak detection system that is not located completely above the seasonal high water table must demonstrate that the operation of the leak detection system will not be adversely affected by the presence of ground water.

(d) The Regional Administrator may approve alternative design or operating practices to those specified in paragraph (c) of this section if the owner or operator demonstrates to the Regional Administrator that such design and operating practices, together with location characteristics:

(1) Will prevent the migration of any hazardous constituent into the ground water or surface water at least as effectively as the liners and leachate collection and removal system specified in paragraph (c) of this section; and

(2) Will allow detection of leaks of hazardous constituents through the top liner at least as effectively.

* * * * *

(f) The owner or operator of any replacement surface impoundment unit is exempt from paragraph (c) of this section if:

(1) The existing unit was constructed in compliance with the design standards of sections 3004 (o)(1)(A)(i) and (o)(5) of the Resource Conservation and Recovery Act; and

(2) There is no reason to believe that the liner is not functioning as designed.

* * * * *

6. New §§ 264.222 and 264.223 are added to read as follows:

§ 264.222 Action leakage rate.

(a) The Regional Administrator shall approve an action leakage rate for surface impoundment units subject to § 264.221 (c) or (d). The action leakage rate is the maximum design flow rate that the leak detection system (LDS) can remove without the fluid head on the bottom liner exceeding 1 foot. The action leakage rate must include an adequate safety margin to allow for uncertainties in the design (e.g., slope, hydraulic conductivity, thickness of drainage material), construction, operation, and location of the LDS, waste and leachate characteristics, likelihood and amounts of other sources of liquids in the LDS, and proposed response actions (e.g., the action leakage rate must consider decreases in the flow capacity of the system over time resulting from siltation and clogging, rib layover and creep of synthetic components of the system, overburden pressures, etc.).

(b) To determine if the action leakage rate has been exceeded, the owner or operator must convert the weekly or monthly flow rate from the monitoring data obtained under § 264.226(d) to an average daily flow rate (gallons per acre per day) for each sump. Unless the Regional Administrator approves a different calculation, the average daily flow rate for each sump must be calculated weekly during the active life and closure period, and if the unit is

closed in accordance with § 264.228(b), monthly during the post-closure care period when monthly monitoring is required under § 264.226(d).

§ 264.223 Response actions.

(a) The owner or operator of surface impoundment units subject to § 264.221 (c) or (d) must have an approved response action plan before receipt of waste. The response action plan must set forth the actions to be taken if the action leakage rate has been exceeded. At a minimum, the response action plan must describe the actions specified in paragraph (b) of this section.

(b) If the flow rate into the leak detection system exceeds the action leakage rate for any sump, the owner or operator must:

(1) Notify the Regional Administrator in writing of the exceedence within 7 days of the determination;

(2) Submit a preliminary written assessment to the Regional Administrator within 14 days of the determination, as to the amount of liquids, likely sources of liquids, possible location, size, and cause of any leaks, and short-term actions taken and planned;

(3) Determine to the extent practicable the location, size, and cause of any leak;

(4) Determine whether waste receipt should cease or be curtailed, whether any waste should be removed from the unit for inspection, repairs, or controls, and whether or not the unit should be closed;

(5) Determine any other short-term and longer-term actions to be taken to mitigate or stop any leaks; and

(6) Within 30 days after the notification that the action leakage rate has been exceeded, submit to the Regional Administrator the results of the analyses specified in paragraphs (b) (3), (4), and (5) of this section, the results of actions taken, and actions planned. Monthly thereafter, as long as the flow rate in the leak detection system exceeds the action leakage rate, the owner or operator must submit to the Regional Administrator a report summarizing the results of any remedial actions taken and actions planned.

(c) To make the leak and/or remediation determinations in paragraphs (b) (3), (4), and (5) of this section, the owner or operator must:

(1)(i) Assess the source of liquids and amounts of liquids by source,

(ii) Conduct a fingerprint, hazardous constituent, or other analyses of the liquids in the leak detection system to identify the source of liquids and possible location of any leaks, and the hazard and mobility of the liquid; and

(iii) Assess the seriousness of any leaks in terms of potential for escaping into the environment; or

(2) Document why such assessments are not needed.

7. Section 264.226 is amended by adding new paragraph (d) to read as follows:

§ 264.226 Monitoring and inspection.

* * * * *

(d)(1) An owner or operator required to have a leak detection system under § 264.221 (c) or (d) must record the amount of liquids removed from each leak detection system sump at least once each week during the active life and closure period.

(2) After the final cover is installed, the amount of liquids removed from each leak detection system sump must be recorded at least monthly. If the liquid level in the sump stays below the pump operating level for two consecutive months, the amount of liquids in the sumps must be recorded at least quarterly. If the liquid level in the sump stays below the pump operating level for two consecutive quarters, the amount of liquids in the sumps must be recorded at least semi-annually. If at any time during the post-closure care period the pump operating level is exceeded at units on quarterly or semi-annual recording schedules, the owner or operator must return to monthly recording of amounts of liquids removed from each sump until the liquid level again stays below the pump operating level for two consecutive months.

(3) "Pump operating level" is a liquid level proposed by the owner or operator and approved by the Regional Administrator based on pump activation level, sump dimensions, and level that avoids backup into the drainage layer and minimizes head in the sump.

8. Section 264.228 is amended by redesignating paragraphs (b)(2) and (b)(3) as paragraphs (b)(3) and (b)(4) respectively, and by adding a new paragraph (b)(2) to read as follows:

§ 264.228 Closure and post-closure care.

* * * * *

(b) * * *

(2) Maintain and monitor the leak detection system in accordance with §§ 264.221(c)(2)(iv) and (3) and 264.226(d), and comply with all other applicable leak detection system requirements of this part;

* * * * *

9. Section 264.251 is amended by redesignating paragraphs (c), (d), (e), (f), and (g) as paragraphs (g), (h), (i), (j) and (k), respectively, and by adding new paragraphs (c), (d), (e), and (f) to read as follows:

§ 264.251 Design and operating requirements.

* * * * *

(c) The owner or operator of each new waste pile unit on which construction commences after January 29, 1992, each lateral expansion of a waste pile unit on which construction commences after July 29, 1992, and each replacement of an existing waste pile unit that is to commence reuse after July 29, 1992 must install two or more liners and a leachate collection and removal system above and between such liners. "Construction commences" is as defined in § 260.10 under "existing facility".

(1)(i) The liner system must include:

(A) A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into such liner during the active life and post-closure care period; and

(B) A composite bottom liner, consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component during the active life and post-closure care period. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least 3 feet (91 cm) of compacted soil material with a hydraulic conductivity of no more than 1×10^{-7} cm/sec.

(ii) The liners must comply with paragraphs (a)(1)(i), (ii), and (iii) of this section.

(2) The *leachate collection and removal system* immediately above the top liner must be designed, constructed, operated, and maintained to collect and remove leachate from the waste pile during the active life and post-closure care period. The Regional Administrator will specify design and operating conditions in the permit to ensure that the leachate depth over the liner does not exceed 30 cm (one foot). The leachate collection and removal system must comply with paragraphs (c)(3)(iii) and (iv) of this section.

(3) The *leachate collection and removal system* between the liners, and immediately above the bottom composite liner in the case of multiple leachate collection and removal systems, is also a *leak detection system*. This leak detection system must be capable of detecting, collecting, and removing leaks of hazardous constituents at the earliest practicable time through all areas of the top liner

likely to be exposed to waste or leachate during the active life and post-closure care period. The requirements for a leak detection system in this paragraph are satisfied by installation of a system that is, at a minimum:

(i) Constructed with a bottom slope of one percent or more;

(ii) Constructed of granular drainage materials with a hydraulic conductivity of 1×10^{-2} cm/sec or more and a thickness of 12 inches (30.5 cm) or more; or constructed of synthetic or geonet drainage materials with a transmissivity of 3×10^{-5} m^2/sec or more:

(iii) Constructed of materials that are chemically resistant to the waste managed in the waste pile and the leachate expected to be generated, and of sufficient strength and thickness to prevent collapse under the pressures exerted by overlying wastes, waste cover materials, and equipment used at the waste pile;

(iv) Designed and operated to minimize clogging during the active life and post-closure care period; and

(v) Constructed with sumps and liquid removal methods (e.g., pumps) of sufficient size to collect and remove liquids from the sump and prevent liquids from backing up into the drainage layer. Each unit must have its own sump(s). The design of each sump and removal system must provide a method for measuring and recording the volume of liquids present in the sump and of liquids removed.

(4) The owner or operator shall collect and remove pumpable liquids in the leak detection system sumps to minimize the head on the bottom liner.

(5) The owner or operator of a leak detection system that is not located completely above the seasonal high water table must demonstrate that the operation of the leak detection system will not be adversely affected by the presence of ground water.

(d) The Regional Administrator may approve alternative design or operating practices to those specified in paragraph (c) of this section if the owner or operator demonstrates to the Regional Administrator that such design and operating practices, together with location characteristics:

(1) Will prevent the migration of any hazardous constituent into the ground water or surface water at least as effectively as the liners and leachate collection and removal systems specified in paragraph (c) of this section; and

(2) Will allow detection of leaks of hazardous constituents through the top liner at least as effectively.

(e) Paragraph (c) of this section does not apply to monofills that are granted a waiver by the Regional Administrator in accordance with § 264.221(e).

(f) The owner or operator of any replacement waste pile unit is exempt from paragraph (c) of this section if:

(1) The existing unit was constructed in compliance with the design standards of section 3004(o)(1)(A)(i) and (o)(5) of the Resource Conservation and Recovery Act; and

(2) There is no reason to believe that the liner is not functioning as designed.

* * * * *

10. New §§ 264.252 and 264.253 are added to read as follows:

§ 264.252 Action leakage rate.

(a) The Regional Administrator shall approve an action leakage rate for surface impoundment units subject to § 264.251(c) or (d). The action leakage rate is the maximum design flow rate that the leak detection system (LDS) can remove without the fluid head on the bottom liner exceeding 1 foot. The action leakage rate must include an adequate safety margin to allow for uncertainties in the design (e.g., slope, hydraulic conductivity, thickness of drainage material), construction operation, and location of the LDS, waste and leachate characteristics, likelihood and amounts of other sources of liquids in the LDS, and proposed response actions (e.g., the action leakage rate must consider decreases in the flow capacity of the system over time resulting from siltation and clogging, rib layover and creep of synthetic components of the system, overburden pressures, etc.).

(b) To determine if the action leakage rate has been exceeded, the owner or operator must convert the weekly flow rate from the monitoring data obtained under § 264.254(c) to an average daily flow rate (gallons per acre per day) for each sump. Unless the Regional Administrator approves a different calculation, the average daily flow rate for each sump must be calculated weekly during the active life and closure period.

§ 264.253 Response actions.

(a) The owner or operator of waste pile units subject to § 264.251 (c) or (d) must have an approved response action plan before receipt of waste. The response action plan must set forth the actions to be taken if the action leakage rate has been exceeded. At a minimum, the response action plan must describe the actions specified in paragraph (b) of this section.

(b) If the flow rate into the leak detection system exceeds the action leakage rate for any sump, the owner or operator must:

(1) Notify the Regional Administrator in writing of the exceedance within 7 days of the determination;

(2) Submit a preliminary written assessment to the Regional Administrator within 14 days of the determination, as to the amount of liquids, likely sources of liquids, possible location, size, and cause of any leaks, and short-term actions taken and planned;

(3) Determine to the extent practicable the location, size, and cause of any leak;

(4) Determine whether waste receipt should cease or be curtailed, whether any waste should be removed from the unit for inspection, repairs, or controls, and whether or not the unit should be closed;

(5) Determine any other short-term and long-term actions to be taken to mitigate or stop any leaks; and

(6) Within 30 days after the notification that the action leakage rate has been exceeded, submit to the Regional Administrator the results of the analyses specified in paragraphs (b) (3), (4), and (5) of this section, the results of actions taken, and actions planned. Monthly thereafter, as long as the flow rate in the leak detection system exceeds the action leakage rate, the owner or operator must submit to the Regional Administrator a report summarizing the results of any remedial actions taken and actions planned.

(c) To make the leak and/or remediation determinations in paragraphs (b) (3), (4), and (5) of this section, the owner or operator must:

(1)(i) Assess the source of liquids and amounts of liquids by source,

(ii) Conduct a fingerprint, hazardous constituent, or other analyses of the liquids in the leak detection system to identify the source of liquids and possible location of any leaks, and the hazard and mobility of the liquid; and

(iii) Assess the seriousness of any leaks in terms of potential for escaping into the environment; or

(2) Document why such assessments are not needed.

11. Section 264.254 is amended by adding new paragraph (c) to read as follows:

§ 264.254 Monitoring and inspection.

* * * * *

(c) An owner or operator required to have a leak detection system under § 264.251(c) must record the amount of liquids removed from each leak detection system sump at least once each week during the active life and closure period.

12. Section 264.301 is amended by redesignating paragraphs (f), (g), (h), (i),

(j), and (k) as paragraphs (g), (h), (i), (j), (k), and (l), respectively, by revising paragraphs (c) and (d), and by adding new paragraph (f) to read as follows:

§ 264.301 Design and operating requirements.

* * * * *

(c) The owner or operator of each new landfill unit on which construction commences after January 29, 1992, each lateral expansion of a landfill unit on which construction commences after July 29, 1992, and each replacement of an existing landfill unit that is to commence reuse after July 29, 1992 must install two or more liners and a leachate collection and removal system above and between such liners. "Construction commences" is as defined in § 260.10 of this chapter under "existing facility".

(1)(i) The *liner system* must include:

(A) A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into such liner during the active life and post-closure care period; and

(B) A composite bottom liner, consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component during the active life and post-closure care period. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least 3 feet (91 cm) of compacted soil material with a hydraulic conductivity of no more than 1×10^{-7} cm/sec.

(ii) The liners must comply with paragraphs (a)(1) (i), (ii), and (iii) of this section.

(2) The *leachate collection and removal system* immediately above the top liner must be designed, constructed, operated, and maintained to collect and remove leachate from the landfill during the active life and post-closure care period. The Regional Administrator will specify design and operating conditions in the permit to ensure that the leachate depth over the liner does not exceed 30 cm (one foot). The leachate collection and removal system must comply with paragraphs (3)(c) (iii) and (iv) of this section.

(3) The *leachate collection and removal system* between the liners, and immediately above the bottom composite liner in the case of multiple leachate collection and removal systems, is also a *leak detection system*. This leak detection system must be capable of detecting, collecting, and removing leaks of hazardous constituents at the earliest practicable time through all areas of the top liner likely to be exposed to waste or leachate during the active life and post-closure care period. The requirements for a leak detection system in this paragraph are satisfied by installation of a system that is, at a minimum:

(i) Constructed with a bottom slope of one percent or more;

(ii) Constructed of granular drainage materials with a hydraulic conductivity of 1×10^{-2} cm/sec or more and a thickness of 12 inches (30.5 cm) or more; or constructed of synthetic or geonet drainage materials with a transmissivity of 3×10^{-5} m^2/sec or more;

(iii) Constructed of materials that are chemically resistant to the waste managed in the landfill and the leachate expected to be generated, and of sufficient strength and thickness to prevent collapse under the pressures exerted by overlying wastes, waste cover materials, and equipment used at the landfill;

(iv) Designed and operated to minimize clogging during the active life and post-closure care period; and

(v) Constructed with sumps and liquid removal methods (e.g., pumps) of sufficient size to collect and remove liquids from the sump and prevent liquids from backing up into the drainage layer. Each unit must have its own sump(s). The design of each sump and removal system must provide a method for measuring and recording the volume of liquids present in the sump and of liquids removed.

(4) The owner or operator shall collect and remove pumpable liquids in the leak detection system sumps to minimize the head on the bottom liner.

(5) The owner or operator of a leak detection system that is not located completely above the seasonal high water table must demonstrate that the operation of the leak detection system will not be adversely affected by the presence of ground water.

(d) The Regional Administrator may approve alternative design or operating practices to those specified in paragraph (c) of this section if the owner or operator demonstrates to the Regional Administrator that such design and operating practices, together with location characteristics:

(1) Will prevent the migration of any hazardous constituent into the ground water or surface water at least as effectively as the liners and leachate collection and removal systems specified in paragraph (c) of this section; and

(2) Will allow detection of leaks of hazardous constituents through the top liner at least as effectively.

* * * * *

(f) The owner or operator of any replacement landfill unit is exempt from paragraph (c) of this section if:

(1) The existing unit was constructed in compliance with the design standards of section 3004(o)(1)(A)(i) and (o)(5) of the Resource Conservation and Recovery Act; and

(2) There is no reason to believe that the liner is not functioning as designed.

* * * * *

13. New § 264.302 is added to read as follows:

§ 264.302 Action leakage rate.

(a) The Regional Administrator shall approve an action leakage rate for surface impoundment units subject to § 264.301(c) or (d). The action leakage rate is the maximum design flow rate that the leak detection system (LDS) can remove without the fluid head on the bottom liner exceeding 1 foot. The action leakage rate must include an adequate safety margin to allow for uncertainties in the design (e.g., slope, hydraulic conductivity, thickness of drainage material), construction, operation, and location of the LDS, waste and leachate characteristics, likelihood and amounts of other sources of liquids in the LDS, and proposed response actions (e.g., the action leakage rate must consider decreases in the flow capacity of the system over time resulting from siltation and clogging, rib layover and creep of synthetic components of the system, overburden pressures, etc.).

(b) To determine if the action leakage rate has been exceeded, the owner or operator must convert the weekly or monthly flow rate from the monitoring data obtained under § 264.303(c), to an average daily flow rate (gallons per acre per day) for each sump. Unless the Regional Administrator approves a different calculation, the average daily flow rate for each sump must be calculated weekly during the active life and closure period, and monthly during the post-closure care period when monthly monitoring is required under § 264.303(c).

14. Section 264.303 is amended by adding new paragraph (c) to read as follows:

§ 264.303 Monitoring and inspection.

* * * * *

(c)(1) An owner or operator required to have a leak detection system under § 264.301(c) or (d) must record the amount of liquids removed from each leak detection system sump at least

once each week during the active life and closure period.

(2) After the final cover is installed, the amount of liquids removed from each leak detection system sump must be recorded at least monthly. If the liquid level in the sump stays below the pump operating level for two consecutive months, the amount of liquids in the sumps must be recorded at least quarterly. If the liquid level in the sump stays below the pump operating level for two consecutive quarters, the amount of liquids in the sumps must be recorded at least semi-annually. If at any time during the post-closure care period the pump operating level is exceeded at units on quarterly or semi-annual recording schedules, the owner or operator must return to monthly recording of amounts of liquids removed from each sump until the liquid level again stays below the pump operating level for two consecutive months.

(3) "Pump operating level" is a liquid level proposed by the owner or operator and approved by the Regional Administrator based on pump activation level, sump dimensions, and level that avoids backup into the drainage layer and minimizes head in the sump.

15. New § 264.304 is added to read as follows:

§ 264.304 Response actions.

(a) The owner or operator of landfill units subject to § 264.301(c) or (d) must have an approved response action plan before receipt of waste. The response action plan must set forth the actions to be taken if the action leakage rate has been exceeded. At a minimum, the response action plan must describe the actions specified in paragraph (b) of this section.

(b) If the flow rate into the leak detection system exceeds the action leakage rate for any sump, the owner or operator must:

(1) Notify the Regional Administrator in writing of the exceedence within 7 days of the determination;

(2) Submit a preliminary written assessment to the Regional Administrator within 14 days of the determination, as to the amount of liquids, likely sources of liquids, possible location, size, and cause of any leaks, and short-term actions taken and planned;

(3) Determine to the extent practicable the location, size, and cause of any leak;

(4) Determine whether waste receipt should cease or be curtailed, whether any waste should be removed from the unit for inspection, repairs, or controls, and whether or not the unit should be closed;

(5) Determine any other short-term and longer-term actions to be taken to mitigate or stop any leaks; and

(6) Within 30 days after the notification that the action leakage rate has been exceeded, submit to the Regional Administrator the results of the analyses specified in paragraphs (b)(3), (4), and (5) of this section, the results of actions taken, and actions planned. Monthly thereafter, as long as the flow rate in the leak detection system exceeds the action leakage rate, the owner or operator must submit to the Regional Administrator a report summarizing the results of any remedial actions taken and actions planned.

(c) To make the leak and/or remediation determinations in paragraphs (b)(3), (4), and (5) of this section, the owner or operator must:

(1)(i) Assess the source of liquids and amounts of liquids by source,

(ii) Conduct a fingerprint, hazardous constituent, or other analyses of the liquids in the leak detection system to identify the source of liquids and possible location of any leaks, and the hazard and mobility of the liquid; and

(iii) Assess the seriousness of any leaks in terms of potential for escaping into the environment; or

(2) Document why such assessments are not needed.

16. Section 264.310 is amended by redesignating paragraphs (b)(3), (4), and (5) as paragraphs (b)(4), (5), and (6) respectively, and by adding a new paragraph (b)(3) to read as follows:

§ 264.310 Closure and post-closure care.

* * * * *

(b) * * *

(3) Maintain and monitor the leak detection system in accordance with §§ 264.301(c)(3)(iv) and (4) and 264.303(c), and comply with all other applicable leak detection system requirements of this part;

* * * * *

PART 265—INTERIM STATUS STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

1. The authority citation for Part 265 is revised to read as follows:

Authority: 42 U.S.C. 6905, 6912(a), 6924, 6925, 6935, and 6936.

2. Section 265.15 is amended by revising paragraph (b)(4) to read as follows:

§ 265.15 General inspection requirements.

* * * * *

(b) * * *

(4) The frequency of inspection may vary for the items on the schedule. However, it should be based on the rate of deterioration of the equipment and the probability of an environmental or human health incident if the deterioration, malfunction, or any operator error goes undetected between inspections. Areas subject to spills, such as loading and unloading areas, must be inspected daily when in use. At a minimum, the inspection schedule must include the items and frequencies called for in §§ 265.174, 265.193, 265.195, 265.226, 265.260, 265.278, 265.304, 265.347, 265.377, 265.403, 265.1033, 265.1052, 265.1053, and 265.1058, where applicable.

* * * * *

3. Subpart B is amended by adding § 265.19 to read as follows:

§ 265.19 Construction quality assurance program.

(a) *CQA program.* (1) A construction quality assurance (CQA) program is required for all surface impoundment, waste pile, and landfill units that are required to comply with §§ 265.221(a), 265.254, and 265.301(a). The program must ensure that the constructed unit meets or exceeds all design criteria and specifications in the permit. The program must be developed and implemented under the direction of a CQA officer who is a registered professional engineer.

(2) The CQA program must address the following physical components, where applicable:

(i) Foundations;

(ii) Dikes;

(iii) Low-permeability soil liners;

(iv) Geomembranes (flexible membrane liners);

(v) Leachate collection and removal systems and leak detection systems; and

(vi) Final cover systems.

(b) *Written CQA plan.* Before construction begins on a unit subject to the CQA program under paragraph (a) of this section, the owner or operator must develop a written CQA plan. The plan must identify steps that will be used to monitor and document the quality of materials and the condition and manner of their installation. The CQA plan must include:

(1) Identification of applicable units, and a description of how they will be constructed.

(2) Identification of key personnel in the development and implementation of the CQA plan, and CQA officer qualifications.

(3) A description of inspection and sampling activities for all unit components identified in paragraph

(a)(2) of this section, including observations and tests that will be used before, during, and after construction to ensure that the construction materials and the installed unit components meet the design specifications. The description must cover: Sampling size and locations; frequency of testing; data evaluation procedures; acceptance and rejection criteria for construction materials; plans for implementing corrective measures; and data or other information to be recorded and retained in the operating record under § 265.73.

(c) *Contents of program.* (1) The CQA program must include observations, inspections, tests, and measurements sufficient to ensure:

(i) Structural stability and integrity of all components of the unit identified in paragraph (a)(2) of this section;

(ii) Proper construction of all components of the liners, leachate collection and removal system, leak detection system, and final cover system, according to permit specifications and good engineering practices, and proper installation of all components (e.g., pipes) according to design specifications;

(iii) Conformity of all materials used with design and other material specifications under §§ 264.221, 264.251, and 264.301 of this chapter.

(2) The CQA program shall include test fills for compacted soil liners, using the same compaction methods as in the full-scale unit, to ensure that the liners are constructed to meet the hydraulic conductivity requirements of §§ 264.221(c)(1), 264.251(c)(1), and 264.301(c)(1) of this chapter in the field. Compliance with the hydraulic conductivity requirements must be verified by using in-situ testing on the constructed test fill. The test fill requirement is waived where data are sufficient to show that a constructed soil liner meets the hydraulic conductivity requirements of §§ 264.221(c)(1), 264.254(c)(1), and 264.301(c)(1) of this chapter in the field.

(d) *Certification.* The owner or operator of units subject to § 265.19 must submit to the Regional Administrator by certified mail or hand delivery, at least 30 days prior to receiving waste, a certification signed by the CQA officer that the CQA plan has been successfully carried out and that the unit meets the requirements of §§ 265.221(a), 265.254, or 265.301(a). The owner or operator may receive waste in the unit after 30 days from the Regional Administrator's receipt of the CQA certification unless the Regional Administrator determines in writing that the construction is not acceptable, or extends the review period for a maximum of 30 more days, or seeks additional information from the owner or operator during this period. Documentation supporting the CQA officer's certification must be furnished to the Regional Administrator upon request.

4. Section 265.73 is amended by revising paragraph (b)(6) to read as follows:

§ 265.73 Operating record.

* * * * *

(b) * * *

(6) Monitoring, testing, or analytical data, and corrective action where required by subpart F and §§ 265.19, 265.90, 265.94, 265.191, 265.193, 265.195, 265.222, 265.223, 265.226, 265.255, 265.259, 265.260, 265.276, 265.278, 265.280(d)(1), 265.302–265.304, 265.347, 265.377, 265.1034(c)–265.1034(f), 265.1035, 265.1063(d)–264.1063(i), and 265.1064.

* * * * *

5. Section 265.221 is amended by revising the section heading and by revising paragraphs (a) and (c) to read as follows:

§ 265.221 Design and operating requirements.

(a) The owner or operator of each new surface impoundment unit on which construction commences after January 29, 1992, each lateral expansion of a surface impoundment unit on which construction commences after July 29, 1992, and each replacement of an existing surface impoundment unit that is to commence reuse after July 29, 1992 must install two or more liners and a leachate collection and removal system between such liners, and operate the leachate collection and removal system, in accordance with § 264.221(c), unless exempted under § 264.221(d), (e), or (f), of this chapter. "Construction commences" is as defined in § 260.10 of this chapter under "existing facility."

* * * * *

(c) The owner or operator of any replacement surface impoundment unit is exempt from paragraph (a) of this section if:

(1) The existing unit was constructed in compliance with the design standards of § 3004(o)(1)(A)(i) and (o)(5) of the Resource Conservation and Recovery Act; and

(2) There is no reason to believe that the liner is not functioning as designed.

* * * * *

6. Paragraphs (a) and (b) of § 265.222 are transferred to § 265.221 and redesignated as paragraphs (f) and (g), respectively.

7. Section 265.222, is amended by revising, the section heading and adding paragraphs (a) through (c) and § 265.223 is added to read as follows:

§ 265.222 Action leakage rate.

(a) The owner or operator of surface impoundment units subject to § 265.221(a) must submit a proposed action leakage rate to the Regional Administrator when submitting the notice required under § 265.221(b). Within 60 days of receipt of the notification, the Regional Administrator will: Establish an action leakage rate, either as proposed by the owner or operator or modified using the criteria in this section; or extend the review period for up to 30 days. If no action is taken by the Regional Administrator before the original 60 or extended 90 day review periods, the action leakage rate will be approved as proposed by the owner or operator.

(b) The Regional Administrator shall approve an action leakage rate for surface impoundment units subject to § 265.221(a). The action leakage rate is the maximum design flow rate that the leak detection system (LDS) can remove without the fluid head on the bottom liner exceeding 1 foot. The action leakage rate must include an adequate safety margin to allow for uncertainties in the design (e.g., slope, hydraulic conductivity, thickness of drainage material), construction, operation, and location of the LDS, waste and leachate characteristics, likelihood and amounts of other sources of liquids in the LDS, and proposed response actions (e.g., the action leakage rate must consider decreases in the flow capacity of the system over time resulting from siltation and clogging, rib layover and creep of synthetic components of the system, overburden pressures, etc.).

(c) To determine if the action leakage rate has been exceeded, the owner or operator must convert the weekly or monthly flow rate from the monitoring data obtained under § 265.226(b), to an average daily flow rate (gallons per acre per day) for each sump. Unless the Regional Administrator approves a different calculation, the average daily flow rate for each sump must be calculated weekly during the active life and closure period, and if the unit closes in accordance with § 265.228(a)(2), monthly during the post-closure care period when monthly monitoring is required under § 265.226(b).

§ 265.223 Response actions.

(a) The owner or operator of surface impoundment units subject to § 265.221(a) must submit a response action plan to the Regional Administrator when submitting the

proposed action leakage rate under § 265.222. The response action plan must set forth the actions to be taken if the action leakage rate has been exceeded. At a minimum, the response action plan must describe the actions specified in paragraph (b) of this section.

(b) If the flow rate into the leak detection system exceeds the action leakage rate for any sump, the owner or operator must:

(1) Notify the Regional Administrator in writing of the exceedence within 7 days of the determination;

(2) Submit a preliminary written assessment to the Regional Administrator within 14 days of the determination, as to the amount of liquids, likely sources of liquids, possible location, size, and cause of any leaks, and short-term actions taken and planned;

(3) Determine to the extent practicable the location, size, and cause of any leak;

(4) Determine whether waste receipt should cease or be curtailed, whether any waste should be removed from the unit for inspection, repairs, or controls, and whether or not the unit should be closed;

(5) Determine any other short-term and longer-term actions to be taken to mitigate or stop any leaks; and

(6) Within 30 days after the notification that the action leakage rate has been exceeded, submit to the Regional Administrator the results of the analyses specified in paragraphs (b)(3), (4), and (5) of this section, the results of actions taken, and actions planned. Monthly thereafter, as long as the flow rate in the leak detection system exceeds the action leakage rate, the owner or operator must submit to the Regional Administrator a report summarizing the results of any remedial actions taken and actions planned.

(c) To make the leak and/or remediation determinations in paragraphs (b)(3), (4), and (5) of this section, the owner or operator must:

(1)(i) Assess the source of liquids and amounts of liquids by source,

(ii) Conduct a fingerprint, hazardous constituent, or other analyses of the liquids in the leak detection system to identify the source of liquids and possible location of any leaks, and the hazard and mobility of the liquid; and

(iii) Assess the seriousness of any leaks in terms of potential for escaping into the environment; or

(2) Document why such assessments are not needed.

8. Section 265.226 is amended by revising the section heading and adding new paragraph (b) to read as follows:

§ 265.226 Monitoring and inspection.

* * * * *

(b)(1) An owner or operator required to have a leak detection system under § 265.221(a) must record the amount of liquids removed from each leak detection system sump at least once each week during the active life and closure period.

(2) After the final cover is installed, the amount of liquids removed from each leak detection system sump must be recorded at least monthly. If the liquid level in the sump stays below the pump operating level for two consecutive months, the amount of liquids in the sumps must be recorded at least quarterly. If the liquid level in the sump stays below the pump operating level for two consecutive quarters, the amount of liquids in the sumps must be recorded at least semi-annually. If at any time during the post-closure care period the pump operating level is exceeded at units on quarterly or semi-annual recording schedules, the owner or operator must return to monthly recording of amounts of liquids removed from each sump until the liquid level again stays below the pump operating level for two consecutive months.

(3) "Pump operating level" is a liquid level proposed by the owner or operator and approved by the Regional Administrator based on pump activation level, sump dimensions, and level that avoids backup into the drainage layer and minimizes head in the sump. The timing for submission and approval of the proposed "pump operating level" will be in accordance with § 265.222(a).

9. Section 265.228 is amended by redesignating paragraphs (b)(2) and (3) as paragraphs (b)(3) and (4) respectively, and by adding a new paragraph (b)(2) to read as follows:

§ 265.228 Closure and post-closure care.

* * * * * * *

(b) * * *

(2) Maintain and monitor the leak detection system in accordance with §§ 265.221(c)(2)(iv) and (3) of this chapter and 265.226(b) and comply with all other applicable leak detection system requirements of this part;

* * * * * * *

10. Section 265.254 is revised, including the section heading, to read as follows:

§ 265.254 Design and operating requirements.

The owner or operator of each new waste pile on which construction commences after January 29, 1992, each lateral expansion of a waste pile unit on which construction commences after July 29, 1992, and each such replacement of an existing waste pile unit that is to commence reuse after July 29, 1992 must install two or more liners and a leachate collection and removal system above and between such liners, and operate the leachate collection and removal systems, in accordance with § 264.251(c), unless exempted under § 264.251(d), (e), or (f), of this chapter; and must comply with the procedures of § 265.221(b). "Construction commences" is as defined in § 260.10 of this chapter under "existing facility".

11. New §§ 265.255, 265.259, and 265.260 are added to read as follows:

§ 265.255 Action leakage rates

(a) The owner or operator of waste pile units subject to § 265.254 must submit a proposed action leakage rate to the Regional Administrator when submitting the notice required under § 265.254. Within 60 days of receipt of the notification, the Regional Administrator will: Establish an action leakage rate, either as proposed by the owner or operator or modified using the criteria in this section; or extend the review period for up to 30 days. If no action is taken by the Regional Administrator before the original 60 or extended 90 day review periods, the action leakage rate will be approved as proposed by the owner or operator.

(b) The Regional Administrator shall approve an action leakage rate for surface impoundment units subject to § 265.254. The action leakage rate is the maximum design flow rate that the leak detection system (LDS) can remove without the fluid head on the bottom liner exceeding 1 foot. The action leakage rate must include an adequate safety margin to allow for uncertainties in the design (e.g., slope, hydraulic conductivity, thickness of drainage material), construction, operation, and location of the LDS, waste and leachate characteristics, likelihood and amounts of other sources of liquids in the LDS, and proposed response actions (e.g., the action leakage rate must consider decreases in the flow capacity of the system over time resulting from siltation and clogging, rib layover and creep of synthetic components of the system, overburden pressures, etc.).

(c) To determine if the action leakage rate has been exceeded, the owner or operator must convert the weekly flow rate from the monitoring data obtained under § 265.260, to an average daily flow rate (gallons per acre per day) for each sump. Unless the Regional Administrator approves a different calculation, the average daily flow rate for each sump must be calculated

weekly during the active life and closure period.

§ 265.259 Response actions.

(a) The owner or operator of waste pile units subject to § 265.254 must submit a response action plan to the Regional Administrator when submitting the proposed action leakage rate under § 265.255. The response action plan must set forth the actions to be taken if the action leakage rate has been exceeded. At a minimum, the response action plan must describe the actions specified in paragraph (b) of this section.

(b) If the flow rate into the leak determination system exceeds the action leakage rate for any sump, the owner or operator must:

(1) Notify the Regional Administrator in writing of the exceedence within 7 days of the determination;

(2) Submit a preliminary written assessment to the Regional Administrator within 14 days of the determination, as to the amount of liquids, likely sources of liquids, possible location, size, and cause of any leaks, and short-term actions taken and planned;

(3) Determine to the extent practicable the location, size, and cause of any leak;

(4) Determine whether waste receipts should cease or be curtailed, whether any waste should be removed from the unit for inspection, repairs, or controls, and whether or not the unit should be closed;

(5) Determine any other short-term and longer-term actions to be taken to mitigate or stop any leaks; and

(6) Within 30 days after the notification that the action leakage rate has been exceeded, submit to the Regional Administrator the results of the analyses specified in paragraphs (b)(3), (4), and (5) of this section, the results of actions taken, and actions planned. Monthly thereafter, as long as the flow rate in the leak detection system exceeds the action leakage rate, the owner or operator must submit to the Regional Administrator a report summarizing the results of any remedial actions taken and actions planned.

(c) To make the leak and/or remediation determinations in paragraphs (b)(3), (4), and (5) of this section, the owner or operator must:

(1)(i) Assess the source of liquids and amounts of liquids by source,

(ii) Conduct a fingerprint, hazardous constituent, or other analyses of the liquids in the leak detection system to identify the source of liquids and possible location of any leaks, and the hazard and mobility of the liquid; and

(iii) Assess the seriousness of any leaks in terms of potential for escaping into the environment; or

(2) Document why such assessments are not needed.

§ 265.260 Monitoring and inspection.

An owner or operator required to have a leak detection system under § 265.254 must record the amount of liquids removed from each leak detection system sump at least once each week during the active life and closure period.

12. Section 265.301 is amended by revising the section heading and by revising paragraphs (a) and (c) to read as follows:

§ 265.301 Design and operating requirements.

(a) The owner or operator of each new landfill unit on which construction commences after January 29, 1992, each lateral expansion of a landfill unit on which construction commences after July 29, 1992, and each replacement of an existing landfill unit that is to commence reuse after July 29, 1992 must install two or more liners and a leachate collection and removal system above and between such liners, and operate the leachate collection and removal systems, in accordance with § 264.301(d), (e), or (f), of this chapter. "Construction commences" is as defined in § 260.10 of this chapter under "existing facility".

* * * * * * *

(c) The owner or operator of any replacement landfill unit is exempt from paragraph (a) of this section if:

(1) The existing unit was constructed in compliance with the design standards of section 3004(o)(1)(A)(i) and (o)(5) of the Resource Conservation and Recovery Act; and

(2) There is no reason to believe that the liner is not functioning as designed.

* * * * * * *

13. Paragraphs (a), (b), (c), and (d) of § 265.302 are transferred to § 265.301 and redesignated as paragraphs (f), (g), (h), and (i), respectively.

14. Section 265.302, is amended by revising the section heading and adding paragraphs (a) through (c) and new §§ 265.303 and 265.304 are added to read as follows:

§ 265.302 Action leakage rate.

(a) The owner or operator of landfill units subject to § 265.301(a) must submit a proposed action leakage rate to the Regional Administrator when submitting the notice required under § 265.301(b). Within 60 days of receipt of the notification, the Regional Administrator will: Establish an action leakage rate, either as proposed by the owner or operator or modified using the criteria in this section; or extend the review period for up to 30 days. If no action is taken by the Regional Administrator before the original 60 or extended 90 day review periods, the action leakage rate will be approved as proposed by the owner or operator.

(b) The Regional Administrator shall approve an action leakage rate for surface impoundment units subject to § 265.301(a). The action leakage rate is the maximum design flow rate that the leak detection system (LDS) can remove without the fluid head on the bottom liner exceeding 1 foot. The action leakage rate must include an adequate safety margin to allow for uncertainties in the design (e.g., slope, hydraulic conductivity, thickness of drainage material), construction, operation, and location of the LDS, waste and leachate characteristics, likelihood and amounts of other sources of liquids in the LDS, and proposed response actions (e.g., the action leakage rate must consider decreases in the flow capacity of the system over time resulting from siltation and clogging, rib layover and creep of synthetic components of the system, overburden pressures, etc.).

(c) To determine if the action leakage rate has been exceeded, the owner or operator must convert the weekly or monthly flow rate from the monitoring data obtained under § 265.304 to an average daily flow rate (gallons per acre per day) for each sump. Unless the Regional Administrator approves a different calculation, the average daily flow rate for each sump must be calculated weekly during the active life and closure period, and monthly during the post-closure care period when monthly monitoring is required under § 265.304(b).

§ 265.303 Response actions.

(a) The owner or operator of landfill units subject to § 265.301(a) must submit a response action plan to the Regional Administrator when submitting the proposed action leakage rate under § 265.302. The response action plan must set forth the actions to be taken if the action leakage rate has been exceeded. At a minimum, the response action plan must describe the actions specified in paragraph (b) of this section.

(b) If the flow rate into the leak detection system exceeds the action leakage rate for any sump, the owner or operator must:

(1) Notify the Regional Administrator in writing of the exceedence within 7 days of the determination;

(2) Submit a preliminary written assessment to the Regional Administrator within 14 days of the determination, as to the amount of liquids, likely sources of liquids, possible location, size, and cause of any leaks, and short-term actions taken and planned;

(3) Determine to the extent practicable the location, size, and cause of any leak;

(4) Determine whether waste receipt should cease or be curtailed, whether any waste should be removed from the unit for inspection, repairs, or controls, and whether or not the unit should be closed;

(5) Determine any other short-term and longer-term actions to be taken to mitigate or stop any leaks; and

(6) Within 30 days after the notification that the action leakage rate has been exceeded, submit to the Regional Administrator the results of the analyses specified in paragraphs (b)(3), (4), and (5) of this section, the results of actions taken, and actions planned. Monthly thereafter, as long as the flow rate in the leak detection system exceeds the action leakage rate, the owner or operator must submit to the Regional Administrator a report summarizing the results of any remedial actions taken and actions planned.

(c) To make the leak and/or remediation determinations in paragraphs (b)(3), (4), and (5) of this section, the owner or operator must:

(1)(i) Assess the source of liquids and amounts of liquids by source,

(ii) Conduct a fingerprint, hazardous constituent, or other analyses of the liquids in the leak detection system to identify the source of liquids and possible location of any leaks, and the hazard and mobility of the liquid; and

(iii) Assess the seriousness of any leaks in terms of potential for escaping into the environment; or

(2) Document why such assessments are not needed.

§ 265.304 Monitoring and inspection.

(a) An owner or operator required to have a leak detection system under § 265.301(a) must record the amount of liquids removed from each leak detection system sump at least once each week during the active life and closure period.

(b) After the final cover is installed, the amount of liquids removed from each leak detection system sump must be recorded at least monthly. If the liquid level in the sump stays below the pump operating level for two consecutive months, the amount of liquids in the sumps must be recorded at least quarterly. If the liquid level in the sump stays below the pump operating level for two consecutive quarters, the amount of liquids in the sumps must be recorded at least semi-annually. If at any time during the post-closure care period the pump operating level is exceeded at units on quarterly or semi-annual recording schedules, the owner or operator must return to monthly recording of amounts of liquids removed from each sump until the liquid level again stays below the pump operating level for two consecutive months.

(c) "Pump operating level" is a liquid level proposed by the owner or operator and approved by the Regional Administrator based on pump activation level, sump dimensions, and level that avoids backup into the drainage layer and minimizes head in the sump. The timing for submission and approval of the proposed "pump operating level" will be in accordance with § 265.302(a).

15. Section 265.310 is amended by redesignating paragraphs (b)(2), (3), and (4) as paragraphs (b)(3), (4), and (5), respectively, and by adding a new paragraph (b)(2) to read as follows:

§ 265.310 Closure and post-closure care.

* * * * *

(b) * * *

(2) Maintain and monitor the leak detection system in accordance with §§ 264.301(c)(3)(iv) and (4) of this chapter and 265.304(b), and comply with all other applicable leak detection system requirements of this part;

* * * * *

PART 270—EPA ADMINISTERED PERMIT PROGRAMS: THE HAZARDOUS WASTE PERMIT PROGRAM

1. The authority citation for part 270 continues to read as follows:

Authority: 42 U.S.C. 6905, 6912, 6924, 6925, 6927, 6939, and 6974.

2. Section 270.4 is amended by revising paragraph (a) to read as follows:

§ 270.4 Effect of a permit.

(a) Compliance with a RCRA permit during its term constitutes compliance, for purposes of enforcement, with subtitle C of RCRA except for those requirements not included in the permit which:

(1) Become effective by statute;

(2) Are promulgated under part 268 of this chapter restricting the placement of hazardous wastes in or on the land; or

(3) Are promulgated under part 264 of this chapter regarding leak detection systems for new and replacement surface impoundment, waste pile, and landfill units, and lateral expansions of surface impoundment, waste pile, and landfill units. The leak detection system requirements include double liners, CQA programs, monitoring, action leakage rates, and response action plans, and will be implemented through the procedures of § 270.42 Class 1* permit modifications.

* * * * *

(3) Section 270.17 is amended by redesignating paragraphs (b)(2) and (3) as (b)(6) and (7) respectively; revising paragraph (b); introductory text; adding paragraphs (b)(2) through (b)(5); and revising paragraph (c) to read as follows:

§ 270.17 Specific Part B information requirements for surface impoundments.

* * * * *

(b) Detailed plans and an engineering report describing how the surface impoundment is designed and is or will be constructed, operated, and maintained to meet the requirements of §§ 264.19, 264.221, 264.222, and 264.223 of this chapter, addressing the following items:

(1) * * *

(2) The double liner and leak (leachate) detection, collection, and removal system, if the surface impoundment must meet the requirements of § 264.221(c) of this chapter. If an exemption from the requirements for double liners and a leak detection, collection, and removal system or alternative design is sought as provided by § 264.221(d), (e), or (f) of this chapter, submit appropriate information;

(3) If the leak detection system is located in a saturated zone, submit detailed plans and an engineering report explaining the leak detection system design and operation, and the location of the saturated zone in relation to the leak detection system;

(4) The construction quality assurance (CQA) plan if required under § 264.19 of this chapter;

(5) Proposed action leakage rate, with rationale, if required under § 264.222 of this chapter, and response action plan, if required under § 264.223 of this chapter;

* * * * *

(c) A description of how each surface impoundment, including the double liner system, leak detection system, cover system, and appurtenances for control of overtopping, will be inspected in order to meet the requirements of § 264.226(a), (b), and (d) of this chapter. This information must be included in the inspection plan submitted under § 270.14(b)(5);

* * * * *

4. Section 270.18 is amended by revising paragraphs (c) introductory text, (c)(1) and (d) to read as follows:

§ 270.18 Specific Part B information for waste piles.

* * * * *

(c) Detailed plans and an engineering report describing how the waste pile is designed and is or will be constructed, operated, and maintained to meet the requirements of §§ 264.19, 264.251, 264.252, and 264.253 of this chapter, addressing the following items:

(1)(i) The liner system (except for an existing portion of a waste pile), if the waste pile must meet the requirements of § 264.251(a) of this chapter. If an exemption from the requirement for a liner is sought as provided by § 264.251(b) of this chapter, submit detailed plans, and engineering and hydrogeological reports, as appropriate, describing alternate designs and operating practices that will, in conjunction with location aspects, prevent the migration of any hazardous constituents into the ground water or surface water at any future time;

(ii) The double liner and leak (leachate) detection, collection, and removal system, if the waste pile must meet the requirements of § 264.251(c) of this chapter. If an exemption from the requirements for double liners and a leak detection, collection, and removal system or alternative design is sought as provided by § 264.251(d), (e), or (f) of this chapter, submit appropriate information;

(iii) If the leak detection system is located in a saturated zone, submit detailed plans and an engineering report explaining the leak detection system design and operation, and the location of the saturated zone in relation to the leak detection system;

(iv) The construction quality assurance (CQA) plan if required under § 264.19 of this chapter;

(v) Proposed action leakage rate, with rationale, if required under § 264.252 of this chapter, and response action plan, if required under § 264.253 of this chapter;

* * * * *

(d) A description of how each waste pile, including the double liner system, leachate collection and removal system, leak detection system, cover system, and appurtenances for control of run-on and run-off, will be inspected in order to meet the requirements of § 264.254(a), (b), and (c) of this chapter. This information must be included in the inspection plan submitted under § 270.14(b)(5);

* * * * *

5. Section 270.21 is amended by revising paragraphs (b) introductory text, (b)(1) and (c) to read as follows:

§ 270.21 Specific Part B information requirements for landfills.

* * * * *

(b) Detailed plans and an engineering report describing how the landfill is designed and is or will be constructed, operated, and maintained to meet the requirements of §§ 264.19, 264.301, 264.302, and 264.303 of this chapter, addressing the following items:

(1)(i) The liner system (except for an existing portion of a landfill), if the landfill must meet the requirements of § 264.301(a) of this chapter. If an exemption from the requirement for a liner is sought as provided by § 264.301(b) of this chapter, submit detailed plans, and engineering and hydrogeological reports, as appropriate, describing alternate designs and operating practices that will, in conjunction with location aspects, prevent the migration of any hazardous constituents into the ground water or surface water at any future time;

(ii) The double liner and leak (leachate) detection, collection, and removal system, if the landfill must meet the requirements of § 264.301(c) of this chapter. If an exemption from the requirements for double liners and a leak detection, collection, and removal system or alternative design is sought as provided by § 264.301(d), (e), or (f) of this chapter, submit appropriate information;

(iii) If the leak detection system is located in a saturated zone, submit detailed plans and an engineering report explaining the leak detection system design and operation, and the location of the saturated zone in relation to the leak detection system;

(iv) The construction quality assurance (CQA) plan if required under § 264.19 of this chapter;

(v) Proposed action leakage rate, with rationale, if required under § 264.302 of this chapter, and response action plan, if required under § 264.303 of this chapter;

* * * * *

(c) A description of how each landfill, including the double liner system, leachate collection and removal system, leak detection system, cover system, and appurtenances for control of run-on and run-off, will be inspected in order to meet the requirements of § 264.303(a), (b), and (c) of this chapter. This information must be included in the inspection plan submitted under § 270.14(b)(5);

* * * * *

6. Section 270.42 is amended by adding the following to Appendix I:

§ 270.42 Permit modification at the request of the permittee.

* * * * *

Appendix I To § 270.42.—Classification of Permit Modification

Modification	Class
* * * * *	
B. * * *	
7. Construction quality assurance plan:	
a. Changes that the CQA officer certifies in the operating record will provide equivalent or better certainty that the unit components meet the design specifications	1
b. Other changes	2
* * * * *	
H. * * *	
6. Modifications of unconstructed units to comply with §§ 264.221(c), 264.222, 264.223, and 264.226(d)	*1
7. Changes in response action plan:	
a. Increase in action leakage rate	3
b. Change in a specific response reducing its frequency or effectiveness	3
c. Other changes	2
* * * * *	
J. * * *	
7. Modifications of unconstructed units to comply with §§ 264.251(c), 264.252, 264.253, 264.254(c), 264.301(c), 264.302, 264.303(c), and 264.304	*1
8. Changes in response action plan:	
a. Increase in action leakage rate	3
b. Change in a specific response reducing its frequency or effectiveness	3
c. Other changes	2

* * * * *

PART 271—REQUIREMENTS FOR AUTHORIZATION OF STATE HAZARDOUS WASTE PROGRAMS

1. The authority citation for part 271 continues to read as follows:

Authority: 42 U.S.C. 6905, 6912(a), and 6926.

2. Section 271.1(j) is amended by adding the following entry to Table 1 in chronological order by date of publication:

§ 271.1 Purpose and scope.

* * * * *

TABLE 1. REGULATIONS IMPLEMENTING THE HAZARDOUS AND SOLID WASTE AMENDMENTS OF 1984

Promulgation date	Title of regulation	Federal Register reference	Effective date
•	•	•	•
January 29,1992.	Liners and Leak Detection for Hazardous Waste Land Disposal Units [2].	57FR [Insert FEDERAL REGISTER Page Numbers]..	July 29, 1992

[2] The following portions of this rule are not HSWA regulations: §§ 264.19 and 265.19 for final covers

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